

Antiquity

Vol. XXI No. 82

JUNE 1947

Archaeology in Afghanistan*

by R. E. M. WHEELER

Director-General of Archaeology in India

THE Government of Afghanistan recently sent two missions to India, where they were warmly welcomed and made many friends. In September 1946, the Government of India sent in return a small mission to Afghanistan to establish contact between the respective archaeological and historical activities of the two countries, with a view if possible to securing closer cultural collaboration. The Indian mission consisted of the Director General of Archaeology in India and his wife; the Honourable Mr Justice N. G. A. Edgely, President of the Royal Asiatic Society of Bengal—the oldest learned society in Asia; and Mr M. A. Shakur, Curator of the Peshāwar Museum, sent by the Government of the North-West Frontier Province as the immediate neighbour of Afghanistan. The mission travelled in two ex-U.S.A. Army vehicles, a six-wheeled personnel-carrier and a jeep, with two Indian drivers and two Indian attendants.

The State Museum at Kābul, visited by the mission on a number of occasions, contains a small but remarkable collection of antiquities and 'bygones'. It is housed temporarily in a building intended for other purposes, but the construction of a new museum is envisaged. The collection owes its importance mainly to the work of the French Archaeological Mission at Begram, Hadda and other sites, and is essential for the study both of Afghan and of Indian art in the early centuries A.D. Its greatest treasure is the hoard of metalwork, glass and, above all, ivories found in 1937 and 1939 at Begram, 48 miles north of Kābul. In date, the hoard ranges from the 1st to the 3rd centuries A.D., and its origins include probably Alexandria on the one hand (notably, for some of the decorative glassware, a small bronze of Serapis and another Harpocrates analogous with the famous example from Taxila, Punjab) and certainly India on the other. The large collection of ivories, in part comparable with Kushāna work of the Mathurā region, is by far the most extensive series of ancient Indian ivory-carvings in existence, and is essential to any study of Indian art in and about the 2nd century A.D. The importance of the 'find' generally to the student of Indo-Afghan antiquity cannot indeed be exaggerated, and the completion of its publication is eagerly awaited.

Similarly, the stucco sculptures found at Hadda, Kunduz and elsewhere, when amplified by further discoveries more scientifically excavated and recorded than those at present in the museum, will add materially to our knowledge of this aspect of Gandhāra or Indo-Afghan art at Taxila and other Buddhist sites in North-West India. Finally,

* Reprinted by permission from an official report.

ANTIQUITY

an unpublished hoard of silver coins found buried in a pot at Kābul and including some 30 Athenian drachmae, 8 Persian sigloi, over 20 miscellaneous Greek coins of the 5th and 4th centuries B.C., and a dozen examples of the bent-bar punched currency characteristic of North-West India about the time of Alexander the Great is of great importance numismatically and may incidentally help to throw some light upon the disputed significance of Kābul in the 'human geography' of the region in the 4th century B.C.

GEOGRAPHICAL FACTORS OF THE TOUR

Afghanistan represents in the main the western extension of the Himalayan massif into the eastern fringe of the Iranian plateau. To this must be added the great northern plain of Afghan Turkestan, which is alien alike in geographical character and population, and in both links up with the deserts and steppes of Central Asia. The country thus falls into three main geographical zones: central mountain, rising to heights above 16,000 feet; southern plateau, generally at 3000-5000 feet; and northern plain at about 1,000 feet. (See sketch-map, FIG. 1).

As is to be expected, these three physical factors explain much of the human geography of Afghanistan. The mountains are the home of semi-migratory tribes composed probably in part of the residue of earlier and formerly more widely distributed populations, and in part of refugees or failures from the lower lands. These mountaineers are a hardy and seemingly contented folk, containing a considerable mongoloid element: good seasonal labourers, but likely to remain as they are so long as their mountains endure. The plateau, wherever permanent river-water is available for the supply of surface-canals or where the characteristic underground *kārez* or canal-system succeeds in tapping the water-table at the foot of the highlands, supports an industrious Afghan-Iranian population. The northern plain, though settled sporadically by Afghan colonies, is occupied by a dominantly Mongolian population, in part migratory. In the absence of a census, the total population of the country (which is a little larger than France) is guessed at eleven or twelve million, but the migratory element robs the guess of any appreciable validity. State income is derived mainly from fruit-exports and customs-receipts, supplemented in kind by forced labour. There are no railways.

In any consideration of the historical geography of the country, a preliminary word of warning is desirable. High, precipitous and barren—even grim—though the mountain massif be, it is traversable by caravan or tribal traffic at many points. From the Bactrian plain the northern bulwark of the Hindu Kush is pierced at three main places: at Kunduz on the east, at Tashkurgān (anciently Khulm, 5 miles to the north) in the centre; and at Balkh (the former Bactra), replaced since the later middle ages by Mazār-i-Sharīf, in the west. At these points, small but perennial rivers flow out on to the plain, although only the Kunduz river today reaches their natural destination, the Oxus. Through the gaps camel-tracks, now partially supplemented by roads, penetrate without undue difficulty, shortening the valley-routes by bold traverses across mountain spurs and cols. Whilst therefore the mountain zone must have impeded any mass-extension of an evolved civilization such as that which is presumed to have occupied the northern plain in the Graeco-Bactrian period (the 3rd and 2nd centuries B.C.), it in no way barred traders or small groups of Buddhist monks with their craftsmen. The sketch-map (FIG. 1) shows what was perhaps the principal trade-route from Bactra to India, but there were several supplementary or alternative tracks. The occurrence of Buddhist stucco sculpture of the early centuries A.D. in identical sub-classical style at Kunduz in Bactria, Hadda near the eastern fringe of the plateau 5 miles from Jalalābād, and Taxila far away on the Indian plain, illustrates the easy pack-route



circulation of ideas and individuals. Similarly at Bāmiyān, in the heart of the Hindu Kush, the basically Indian art of Buddhism was reinforced by Sassanian elements penetrating up the re-entrants of the Iranian plateau and the broken but traversable country in which they ended.

In such circumstances every caution is necessary in speculating as to the precise origin of a phenomenon such as the 'Afghan-Gandhāra' school of Buddhist art; and the temptation to suppose (with Hackin) that this art received its Hellenistic impress through the spread of Buddhism into the Hellenized Bactria of the 3rd century B.C., when the Mauryan empire of India extended into Afghanistan, is no less difficult than to project the event into the 2nd century A.D. when the Kushāna empire again united a part of the two countries but when the Greek element may have come in from a totally different direction. It is best to admit that the relevancy (if any) of Bactria to this important special problem, save perhaps indirectly as a parent of Greek India, cannot yet be judged. No example of the sub-classical stucco sculpture of India and Afghanistan has yet been referred on objective evidence to a date prior to the Christian era, whilst much of it is certainly of the Kushāna period, long after Greek Bactria and Greek India had alike passed into limbo.

This brings us back to the question of geography. Emphasis of the traversability of the Hindu Kush need not obscure the essential difference between the two sides of the divide. To the north the outlook is towards central and west-central Asia and Europe; even the rivers proclaim the fact by harbouring trout, a Western fish. To the south of the divide, the outlook is towards India and the Arabian sea; the rivers, like those of India, contain no native trout. And it is this trout-less region which has produced the most remarkable contact with India yet discovered in Afghanistan—the Begram hoard, already referred to above (p. 57). Not only does that hoard contain a great mass of purely Indian craftsmanship, but even the Mediterranean glass and metalwork which it also includes came more probably through India than overland from the West. The small bronzes representing Serapis and Harpocrates and some at least of the elaborate glass-ware may be ascribed to Alexandria, and may be presumed therefore to have reached the East by the normal Alexandrian trade-route via the Red Sea and a west-Indian port either in the Indus delta or a little further south. Whether they were traded thence to Begram or whether they were brought to the Begram store-rooms with the ivories from some Indian palace (Taxila, or Mathurā?) can only be conjectured. The period when the new Gupta régime was encroaching westwards from the Ganges valley and the Kushāna power was shrinking towards its ultimate western outposts would fit in well with the character of the hoard; and the beginning of the Gupta Era in A.D. 320 would supply a plausible terminal date for it. In any case the whole find suggests, so far as it goes, an eastern rather than a northern preoccupation for the region south of the Hindu Kush in the period when much of the Gandhāra stucco must have been made. It offers no link either with the Iranian plateau or with the northern plain.

South of Kābul the main problems are of a different kind. There the massif of which the Hindu Kush is the backbone bends towards the south in a great salient, round which the Iranian plateau sweeps boldly south-eastwards from Herat to Kandahār and then northwards to Ghaznī, throwing out upland thoroughfares to Quetta and Kalāt. From these two places, a complex of further routes conducts traffic to the central Indus. In historic times more than one invader has approached or left India by one or other of these passages, and there is reason to suppose that in prehistoric times they were already used by cultures infiltrating from Iran into the Indus valley, possibly also by the reverse process.

Within Afghanistan this region is wholly unexplored. In the 300-mile stretch from Kābul to Kandahār hasty observation from the main road suggested indeed an almost complete absence of 'tells'. One only was observed, and, save for three occupied village-mounds of low altitude in the Kandahār oasis, the immediate neighbourhood of Kandahār itself, although in part adequately watered, seemed equally unproductive. Admittedly, much further exploration is necessary, but the contrast with the 'busy' Bactrian plain in the north is likely to stand, and requires explanation. And between Kandahār and the border at Chaman on the Quetta road, only one tell was seen; at Mundsar, a roadside village 11 miles from Kandahār. The pottery on the surface of this tell was mostly pre-Islamic, but no definitely prehistoric sherd was picked up. Generally, the route from Kandahār to Quetta, easy of transit save for the steep Khojak pass, probably lacked sufficient water for permanent occupation until it reached the Quetta plateau, where four or five small tells show evidence of occupation going back in some cases to the third millennium B.C. or earlier.

THE TOUR

With these and other general factors in view, the mission, aided by its hosts, chose a route which, within the narrow limits of time available, enabled it to see something of the country through which cultural elements are known to have been interchanged between Afghanistan and India. From Kābul it travelled 48 miles northwards to Begram, where M. Meunié, of the French Archaeological Mission, was cutting a trench through a gateway in the southern defences; thence westwards 128 miles to Bāmiyān with its colossal rock-cut Buddhas and its carved and painted chapels (fully illustrated by M. Hackin), and thence north-eastwards 150 miles through the heart of the Hindu Kush to Pul-i-Khumrī. Beyond that place, itself modern, the valley of the Kunduz river broadens out, and at least three Buddhist stupas and monasteries were visible within a radius of 5 miles of the starting point. 'Tells' or 'tāpas', mounds representing towns, villages or homesteads of various but unknown dates, now for the first time became numerous. They were rarely more than 400 feet long or 40 feet high, and many were less. From the top of one of them, twenty others could be seen. Two or three which were visited failed to produce pottery of recognizable character, but it must be remembered that no dated pottery has yet been published from Afghanistan. After crossing a last low spur of the Hindu Kush north of Jar, the party reached the head of the river-plain which is dominated, today as anciently, by Kunduz. At this point, within the outskirts of the village of Aliabād, on the eastern bank of the Kunduz river some 18 miles south of Kunduz town, was found the first major non-Islamic town-site seen by the mission: a great irregular fortification, upwards of 750 by 450 yards along the axes, with the main rampart built apparently from an internal quarry-ditch, two supplementary ramparts and ditches on the slopes, and in-turned entrances. The whole outward aspect of the work is astonishingly similar to that of an Early Iron Age *oppidum* of the Caesarian era in north-western Europe, and the writer of this report has seen nothing quite like it in Asia. The site does not appear to have been recorded previously, and is well worth exploration. Its position, as controlling entry to the Kunduz plain from the mountain massif, is one of obvious importance, and its size and imposing elaborate construction are sufficient indication of no mean city.

The citadel of Kunduz is of smaller size, but is an outstanding tell rendered the more dramatic by its Islamic defences, allegedly destroyed by Jenghis Khan but probably in part of later date. Buried within it is doubtless much of the early history and prehistory of Afghan Turkestan, and some day it will well repay scientific excavation.

Meanwhile, in the neighbourhood is a Buddhist monastery which a few years ago yielded a number of stucco heads in a sub-classical style unlikely perhaps to be later than the 3rd century A.D., although the casual excavation of the site failed to supply objective evidence of date. The sculptures, now in the Kābul Museum save for a single small head in the Mazār-i-Sharīf Museum, were found in a series of chambers roofed with domes carried on semicircular squinches, each of four plain orders—an interesting structural device if of so early a date. Finally, column-bases of the Romano-Attic form noted by Mr Evert Barger in 1938 at Kunduz are rapidly multiplying and were evidently a normal type, probably in the early centuries A.D., both at Kunduz (where the mission discovered two additional specimens and heard of two others), at Balkh (where an excellent column-base and a pilaster-base of this type were noticed), and further south in the vicinity of Begram, where two examples are lying in the courtyard of the excavation-headquarters. It is evident that in all cases the column-shafts had been of wood.

West from Kunduz the party travelled through steppe and desert obscured by a continuous sandstorm but, so far as could be seen, devoid of ancient sites save for one or two domed wells of the 16th century or later and the inevitable ruined mud-brick robāt̄s or caravanserais. At Tashkurgān (92 miles), broken bridges and impassable canals prevented a visit in the time available to the early Islamic and pre-Islamic mounds at Khulm some 4–7 miles north of the town; but of a few tells within sight of the 40-mile stretch of road between Tashkurgān and Mazār-i-Sharīf, one, situated 2 miles north-west of the village of Naibābād and 1½ miles north of the main road, was thickly littered with pre-Islamic but undated potsherds. The tell and its ancillary mounds are some 400 yards in length and rise to a maximum height of about 40 feet. Two of the smaller mounds of the site are covered with lumps of slag and presumably represent a fairly extensive industrial area. The tell would undoubtedly repay excavation, and would be better within the compass of a short-term expedition than major sites such as Kunduz or Balkh.

Mazār-i-Sharīf (38 miles further west), medieval successor of Balkh, is notable for its great tiled Timurid shrine of Hazrat Ali and the remains of a Timurid tomb nearby—the first examples of this individual 15th century style or sub-style encountered by the mission. These buildings have been described and illustrated and do not call for further comment here, save for the observation that their lively colouring and vivid human setting were refreshing after a succession of deserted and dusty tells.

En route from Mazār-i-Sharīf to Balkh (12 miles), the party paused at the derelict city of Takht-i-Pul built in 1855–60 by the father of Abdur Rahmān, whose picturesque figure marks the last phase of Afghanistan as an essentially 'medieval' kingdom. This royal city, oblong in outline, with palace, elaborately painted mosque, and projecting citadel, is a veritable Pompeii, and deserves detailed study both on the ground and from the air. It is in line of descent from Ahmad Shah's 18th century Kandahār, and is an epitome of organized civic planning and construction in the mud-domed desert style, well worthy of a careful monograph.

Balkh, the ancient Bactra, 'Mother of Cities', was the mission's main goal. It has been studied superficially by M. Foucher, who spent two years there in the early twenties of the present century and carried out excavations unfortunately in the least suitable spot—the highest point of the citadel, where there is a maximum depth of Islamic remains of familiar type. The vast site, with its unmeasured implications for Asiatic (including Indian) history and archaeology, is therefore virtually intact and still awaits considered exploration. It is understood that, when adequately staffed by excavators trained in stratigraphical analysis, the French Archaeological Mission

proposes to tackle the problems. Unlike Kunduz and Tashkurgān (Khulm), which occupy fertile but strictly delimited oases watered from rivers of modest size, Balkh stands on an inland delta, from which an extensive canal-system irrigated a considerable tract of country. The vagaries of this inland delta have displaced Balkh in favour of the more modern Mazār-i-Sharīf; but the surviving village of Balkh stands within a vast accumulative city-site extending backwards from Islamic times into an unexplored past. Its ruined fortifications have a circuit of over 7 miles, and the citadel, itself of great size, towers to a height of 100 feet on the northern margin. Probably no site in Asia surpasses Balkh in its appeal to the historical imagination. Here the main trade-routes from China, the Mediterranean and India met. From the battlements can be seen, 10 miles to the south east, the gap through which caravans carried some part of its commerce to Taxila and beyond. Here ruled the Graeco-Bactrian kings whose coinage, extending across the North-West Frontier into the Punjab and beyond, is witness to this traffic rather than to any secure political or cultural hold upon Hindustan.

Pending the scientific excavation of Balkh on a large scale, a cursory examination clearly indicates some part of the line of approach. The multiple defences of the site fall into three main groups: (1) mud-brick walls of Islamic type built on the present ground surface, (2) Islamic walls built on a shapeless rampart often of great size, and (3) lengths of rampart without superimposed Islamic walls. It is manifest that the investigation of the two last categories is a necessary preliminary to further work. Only so can the position and extent of the pre-Islamic cities be identified. Deep digging through and in proximity to the rampart cannot fail to produce results of value. Pending this, any extensive 'area dig' within the circuit would be premature. Incidentally, there are indications that some part of the rampart consists in reality of a succession of parallel mud-brick retaining-walls with intervening earth filling.

In emphasizing the special need for outlining and sampling the pre-Islamic city, the interest of the immense Islamic city should not be overlooked. Here, as elsewhere, Jenghiz Khan is blamed for the final destruction of the town and its inhabitants, but the presence of the celebrated late-Timurid shrine of Abu Nasra Pārsa in the centre of the site is sufficient warning that the city survived in some shape well into the 15th century.

From Balkh, the mission made a day's expedition to Ākchā, 41 miles to the west. Between the two places, eleven major tells were counted within 2 miles of the road. Of these, two are outstanding: Nimlik Tāpa, midway; and Pāreshān Tāpa, 8 miles east-south-east of Ākchā. Both of these would well repay excavation. The Nimlik tell is not less than 50 feet high, and stands within the remains of a circular walled Islamic town. Its earlier origin, however, is sufficiently indicated by a notable discovery made by M. Schlumberger during the visit: that of a part of the base of a coarse buff pottery-vessel with the fragmentary Greek word . . . ΑΠΟC scratched in good Hellenistic script round the lower edge of the side before firing. This is, singularly enough, the first Greek inscription (other than on coins) yet found in Bactria. No better illustration of the dearth of previous exploration within the ancient Graeco-Bactrian kingdom could be desired.

Ākchā itself, though containing a small citadel on a tell, is chiefly remarkable for the ethnological interest of its market-day crowd. Here is Turkestan almost undiluted save by a few Afghan colonists, and the bazaar presents a fascinating assemblage of Mongolian types and costumes.

From Ākchā the mission retraced its steps to Tashkurgān, and thence turned southwards up the course of the Khulm river to Haibak. Only one tell—Mang Qala, 20 miles southeast of Tashkurgān—was observed on the way, and this, though of fair

size, produced no pottery of recognizable type. At Haibak are a notable rock-cut stupa and four artificial grottos of considerable architectural pretension, described somewhat cursorily by Foucher. They are partially unfinished, a fact ascribed by Foucher to the intervention of the White Huns in the 5th century A.D., but equally attributable to the Islamic invasion of the 7th century or indeed to some quite different cause. The whole group deserves more adequate illustration and analysis.

From Haibak the party returned in two days to Kābul where, in addition to enjoying further hospitality, it took the opportunity of visiting some of the Buddhist monuments in the vicinity. These include a number of stupas and monasteries, and two remarkable minar-like monuments of plastered stone with timber bonds, presumably (but not certainly) marking caravan routes in the vicinity. Like so much else, these two minars, unique of their kind, require further investigation.

Southwards from Kābul, the mission paused at Ghaznī, perhaps the most picturesque fortified town of the tour, and visited the tomb of Sultan Mahmud, 2 miles south of the town. The tomb-building dates only from Habibullah, but the original marble cenotaph, of gabled form and with Kufic inscription, remains under its cloth coverings. Between the tomb and the town lie the two famous brick 'towers of victory', well illustrated by Upham Pope.

From Ghaznī to Kandahār the road lies mainly through plateau, with singularly little trace of ancient occupation (see above p. 4). But Kandahār itself is of exceptional interest as an illustration of urban evolution. The earliest city, likely enough of pre-Islamic origin, is screened by a sheer razor-backed crag, along the summit of which fragments of the mud-brick defences adhere precariously. At the foot, the latter swing out in a loop to enclose the melted remains of the mud-brick palace and town destroyed in the 18th century by Nādir Shāh. In the latter part of the century, the city was rebuilt by Ahmad Shāh some 2 miles away on a flat site and a regular oblong plan, squarely fortified and with a square citadel-area within one end. This city remains in full occupation, although all the gateways have been demolished. Recently, begun by Amānullāh but culminating within the present reign, a new cantonment-city, unfortified, has been built between the fortified city of the plain and the fortified city of the hill. Irrigation has turned the oasis into a great fruit-garden; and on all grounds the mission came away with the conviction that the Second City of Afghanistan was easily first in its trimness and the general beauty of its setting.

Between Kandahār and the Indian border at Chaman, *en route* for Quetta, the journey was interrupted only by the inspection of a tell some 11 miles from the starting-point. Otherwise the route was again devoid of ancient vestiges and the proximity of a belt of desert, with a general absence of easy water-supply, was an obvious cause. Whilst readily usable by through-traffic, the route offered few attractions for permanent occupation.

The total journey, Peshāwar-Akchār-Quetta, covered approximately 1,800 miles.

FUTURE RECIPROCAL ACTION

If missions such as those which have now been interchanged between India and Afghanistan are to secure an enduring co-operation, they must be followed by specific action. In the present section, suggestions are put forward whereby this cultural collaboration may be sustained as a matter of routine in such interests as are common to both countries.

It has already been emphasized that in important respects the history and prehistory of Afghanistan and India form an indivisible unit. The researches of Sir Aurel Stein

and others in Baluchistan and Seistan have demonstrated that in prehistoric times the cultural development of these and of the neighbouring Indus region cannot be considered save as a single complex ; and the historic links between them are familiar. This conclusion may, in anticipation, be applied in even larger measure to the great unexplored territories of Afghanistan. It is safe to say that no scientific exploration of the ancient past of Afghanistan can fail to have a direct or indirect bearing upon the ancient past of India. Bodies such as the Archaeological Survey of India, the French Archaeological Mission in Afghanistan, and shortly (it is to be hoped) the Afghan Department of Antiquities, will lose, and the countries represented by them will lose, if they do not work in the closest and friendliest contact with one another. How can this contact best be maintained ? Three ways are suggested :—

(1) First, let it be remembered how readily accessible the two countries are to one another. Peshāwar to Kābul is an easy two-days' journey ; in three weeks of travelling time the Indian mission achieved an unhurried journey north to Turkestan and then south to Kandahār. In India, with railways and tarmac roads, travel is still easier. There is no physical obstacle to the interchange not merely of formal missions but also of individual scholars engaged upon the same general problems. India would welcome the regular visitation of Afghan students of archaeology or history, and the Archaeological Survey of India would always be ready to help them on their way.

(2) In a further respect also, the Archaeological Survey of India may perhaps be of some slight service to its colleagues in Afghanistan. As an institution with nearly half-a-century's continuous growth behind it, it may perhaps be in a position to offer facilities which will necessarily not be available at once to a newly established department elsewhere. If, therefore, when the Afghan Department of Antiquities is constituted, its elder brother the Indian Archaeological Survey can help in the matter of training—whether for archaeological excavation or for the conservation of ancient buildings—it will gladly welcome representatives of Afghanistan as attachés. Participation in a common programme of training is the surest guarantee of future collaboration.

(3) Thirdly, it is essential for an intelligent understanding of each other's problems that Afghan and Indian Students should alike have direct and constant access to the actual materials with which they are severally dealing. This can be done to some extent by occasional loan-exhibitions of Indian art and antiquities at Kābul, and by similar loan-exhibitions from Afghanistan at New Delhi or Calcutta. In this way, some of the best products of both countries could from time to time be made mutually accessible to students and the educated public. But a more enduring form of interchange would be that of small representative collections of 'duplicate' material between the two countries. For example, India could well spare for Kābul a type-collection of objects representing the famous 'Indus Civilization', to which it will probably be found in due course that the early cultures of Afghanistan contributed. Or a good type-collection could be transferred to Afghanistan from Taxila which, as the Indian terminus of the great trade-route from Balkh, was in some respects anciently almost as much as Afghan as an Indian city. Such interchange would be of the highest cultural value, and could begin immediately. Interchange of scholars, interchange of materials, are equally essential to the well-being of research on both sides of the Khyber. All that is required is the approval of the respective governments.

Naval Activity in the Days of Solomon and Rameses III

by JAMES HORNELL

EVER since the beginning of recorded history, Ancient Egypt was dependent upon the goodwill of the Phoenician overlords of the mountain land of the Lebanon for supplies of timber in the long running lengths required for the construction of large ships, especially those intended for use on long voyages by sea; fine timber was also in considerable demand for the making of the elaborate wooden sarcophagi of nobles and of members of the royal family as well as for furniture of superior quality. This lack of suitable native timber made the Egyptians late comers in sea-trading; indeed, it restricted progress so seriously that their water-borne commerce was limited to traffic with Nubia and the South by way of the Nile waterway, to occasional expeditions down the Red Sea to Southern Arabia and to Somaliland (Punt) and to short coasting trips to Phoenicia to buy timber logs and to the coasts of the Sinai Peninsula in search of copper.

In the twentieth dynasty the restless ambition of Rameses III and the enormous expenditure incurred in the struggle to repel the attempted invasion of Egypt from the West by the Libyans, from the North by the Syrians and from overseas by the Vikings of the Greek Islands, had so greatly impoverished the royal treasury that it became increasingly difficult to obtain all the timber required from Phoenicia, for the building up of the country's naval strength against any renewal of invasion from overseas, and to cope with the requirements of expanding maritime trade.

Unfortunately for the land, the political ambition of the priestly caste at Thebes had grown so vaulting during the later years of the Ramesside dynasty, that the High Priest at Thebes had become the virtual ruler of the country; the kingly office was held by successive members of the Ramesside family at the pleasure of the priesthood, who tolerated the kingship as a screen wherewith to mask their exercise of the real powers of State. None of the decadent Ramessides possessed the courage and ability needed to resist the ever-growing domination of the High Priests who, like the Mayors of the Palace in Merovingian France, were become the actual rulers. The favour and fervour of the people for the priestly rule were encouraged by means of every artifice known to the priesthood. Among these the great religious festivals were of special importance.

And it was due to an emergency which arose in connexion with the preparations for one of the periodic ceremonial appearances of the gods in a river fête at Thebes that led to the despatch of an embassy to Phoenicia on a timber-buying mission. The record of the adventures of the messenger was written on a papyrus scroll and by its survival of every hazard of time, it enables us to learn many of the intimate details of the trial and mishaps which befel the luckless envoy.

The last of the Ramessides had recently been made away with by the High Priest Herihor, who thereupon assumed full sovereign power in the State. Soon after his

NAVAL ACTIVITY IN THE DAYS OF SOLOMON AND RAMESES III

accession preparations had been begun for the holding of one of the great ceremonial visits paid by the gods of the Karnak temples to their peers at the great Theban temple at what is now called Luxor. The holy bark of Amun required extensive repair involving almost complete rebuilding. It was through this that it came about that Wenamon was ordered by Herihor to go to Byblos, the modern Jebail, close to the foothills of Lebanon, there to obtain a supply of the great cedar logs required for the repair of the god's festival boat.

The Pharaoh gave his envoy letters to Nasibanebdadu, the Tanite sub-king of the Delta, requesting him to supply the royal messenger with a ship to carry him to Byblos. The Tanite and his consort Tent-amen, a princess of the Egyptian royal house through whom the sub-king owed his throne, duly obeyed and Wenamon embarked on his voyage along the coast of Palestine. It was not long before the first mishap occurred; the gold and silver vessels intended to form the barter present to be given to obtain the timber, were stolen and no redress could be obtained from the local chieftain, who seems to have been a Cretan rover who had obtained a footing on the southern coast of Palestine in the same way as the Danes in Alfred's time secured territory on the coast of East Anglia.

When at last Wenamon did arrive at Byblos, he was empty-handed, without the present required by custom in the East. Wenamon waited long but all his efforts to obtain timber were unsuccessful. The local ruler becoming impatient, showed Wenamon records to prove that former envoys had brought handsome gifts in payment for timber; he demanded that Wenamon should empower a messenger to return to Egypt to bring an amount of gold, silver and goods adequate to cover the value of the timber required. To this Wenamon was forced to agree. The messenger was sent and after some months returned with several articles of gold and silver. Grumbling at the inadequacy of their value, the Byblos chief at length agreed to place 300 men and 300 oxen at Wenamon's disposal; the necessary number of cedars were cut down on the slopes of Lebanon and transported to the port.

All seemed ready for the voyage back to Egypt when pirate ships from Crete entered the harbour with intent to extort their price from the Egyptian and held Wenamon to ransom. Thanks to the efforts of the Byblos chief, they were induced to let their prey go free and to allow him to ship his wood. However, when he did leave port a storm arose and Wenamon's ship was cast ashore on the coast of Cyprus, and he had great trouble to persuade the authorities to allow him to depart. Thence he sailed to Tyre, only to receive an unfriendly reception and to experience much trouble in breaking free. Whether any other misfortunes attended his voyage is obscure, for the end of the papyrus is damaged and broken. But we are allowed to conclude that eventually Wenamon did reach Egypt with his precious cargo of cedar logs.

Besides plank-built ships, traffic with Phoenicia and Palestine was in part maintained by means of rafts. Much of the timber, with the exception of special qualities, was sailed along the coast in the fair weather season when a wind from the north could be relied upon. For most urgent despatch work, it appears that small sailing rafts of 'balsa' type were sometimes employed, as evidenced by a passage in Isaiah (xviii, 1-2) which prophesied disaster to the Ethiopian rulers of the Egypt of that period—the Piankhi dynasty of Nepata (the 23rd of Egypt) in the fateful words:—'Woe to the land shadowing with wings, which is beyond the rivers of Ethiopia, that sendeth ambassadors by sea, even in vessels of bulrushes upon the waters, saying, "Go, ye swift messengers, to a nation scattered and peeled"'. These words can bear no meaning other than that on exceptional occasions calling for swift action, a certain class of papyrus raft-canoe, provided with mast and sail, were used to carry urgent despatches to officials in Palestine.

ANTIQUITY

These slenderly built craft having perforce to remain at sea for several days, must have been protected in some way from the danger of becoming sodden with absorbed water ; either they were coated with bitumen or pitch as was the cradle-raft in which Moses as a baby was exposed, or some other means was taken to ensure adequate waterproofing ; unlike fishing canoes of papyrus or ambatch or the log-catamarans of India, they could not be given a daily drying out upon the beach. Their masting was probably of the bipod or straddle form, which was the usual type of mast in earlier times in Egypt (fifth dynasty) and the only kind suitable for use on fragile craft built of reeds. On Lake Titicaca in South America we see this necessity recognized at the present day. A pole mast would work its way through the vulnerable bottom of the reed bundles whereof it is composed, a circumstance which necessitates the use of bipod masts, with each leg lashed against the bundle of its respective side (Hornell, *Water Transport*, 1946, p. 226).

Until nearly the close of the Ramesside line of rulers, the Egyptians seem to have had little or no experience either in shipbuilding or in seamanship other than what was required for journeys on the Nile or in voyages in the Red Sea during the good weather season and when the wind was favourable. Navigation in the Mediterranean where weather conditions are much more uncertain and dangerous seems to have had little attraction for the Egyptians, who were well served commercially by the enterprising seamen of their more sea-minded neighbours, the sailor-traders of Phoenicia and the maritime tribes of Crete, Cyprus and the Greek mainland and islands. It may be said in truth that it was through the acquaintance thus acquired by these peoples with the great wealth of Egypt and of her apparent defencelessness against attack by sea, which brought about, in the reign of Rameses III, the formation of a powerful confederation of these sea-peoples, aimed at the despoiling of Egypt's wealth. Fortunately for Egypt, the Pharaoh then reigning was a general of immense vitality, foresight and ability. Like our own Alfred, he realized that victory could only lie with him if he met the banded enemies on their own element, the sea, and fought them with either a superiority of force or with more effective weapons.

Rameses was not caught napping ; some of these warlike sea-folk had already gained some degree of footing on the coastland of the delta of the Nile ; their actions had already alarmed him and he realized in good time the nature of the threat which their landings portended. Thus forewarned, he set his mind and all the resources of his kingdom to the task of meeting this danger effectively. His first step was to create and organize a powerful navy. He sent messengers to the coastal rulers of the timber-clothed Lebanon mountains and gave them rich gifts to present to the Phoenician kings when asking their good offices in the purchase of large quantities of the cedarwood and firs required for his purpose of shipbuilding on a grand scale. These gifts consisted mainly of vessels of gold and silver, the most acceptable form of 'currency' then recognized in transaction between sovereign powers. Delays occurred but in the end the timber was supplied and duly arrived in Egypt.

Shipyards were set up, doubtless under the supervision of skilled shipwrights attracted to the service by good rates of pay ; Egyptian carpenters were rounded up and set to learn from and work under the foreign foremen ; the mouths of the Nile were fortified and garrisoned and everything was done which the military skill of that age considered useful for defence.

Concurrently, the work of collecting and training crews for the prospective fleet was taken in hand. Many of them were mercenaries gathered from every available and useful source, Cretans and Phoenicians preferably, with good men attracted from Cyprus and the coast of Asia Minor, and with a sprinkling of wanderers from northern countries—

NAVAL ACTIVITY IN THE DAYS OF SOLOMON AND RAMESES III

among them the ubiquitous Northmen, early predecessors of the Nordic Varangians ; and just in time were these arrangements made. Before long the hordes of sea-rovers from all the shores of the Mediterranean assembled their combined fleets and descended upon the delta, confident of an easy victory over the unwarlike toiling agriculturists of the Nile valley and deltaic effluents.

To their chagrin, they found their opponents' ships were equal to their own and even, in some respects, superior.

Moreover, the Egyptian fleet had the great advantages of being homogeneous in all essentials—their ships were built to one well-ordered design and their crews, in spite of differences in origin, were exercised in identical fashion in order to work together as a single unit under one and the same command. With the invaders there was no such unison ; a score of tongues were spoken and the tendency was for the formation of a number of groups, each with some racial prejudice against one or other of the rest. With the leaders there was also a tendency towards mutual distrust.

When this heterogeneous fleet did come to grips with the Egyptians upon their invasion of the delta, great was their leaders' surprise to find that their opponents' ships were fully the equal of their own and that the crews were no mere horde of conscripted landmen but well trained and well-led sailors and soldiers, equal to any aboard their own vessels. Victory early declared in favour of the Egyptians and today the visitor to the Ramesside temple of Medinet Habu, near Thebes, may see this momentous sea-fight depicted at its height, in vigorous sculpture upon the north wall of this great memorial temple erected to the glory of the royal builder, to perpetuate to all time a pictorial record of his great victories by land and sea.

According to custom many of the ships of the enemy are shown as captured or destroyed with many of their crews flung into the sea by the victorious Egyptian boarders.

The Egyptian ships are distinguished from those of the enemy by the presence of a lion's head placed at the fore-end of the prow. As with the majority of ships of this period, the hull has a crescentic profile with both ends sheered sharply upwards to a sharp point. The oars, with rounded blades, were worked through oar-ports disposed at the junction of the deep protective washstrake with the underbody. The ships of the invading fleet had the body nearly the same in proportions and curvature ; the main differences were in the forms of the ends and the character of the figureheads. The ends of the invaders' ships, stem and stern, rose nearly vertically from the respective ends ; both were similar and each was surmounted by a figurehead in the form of a bird's head, possibly a suggestive emblem indicating the swiftness of the vessel or else a propitiatory votive offering to the protective deity to whom it was dedicated and from whom the crew hoped to receive protection on their voyages. Or it may have reference to the help received by mariners from the flight of birds liberated at times when the crew were uncertain of their proximity to the nearest land (Hornell, *ANTIQUITY*, 1946, xx, pp. 142-9).

In the ships of both fleets a steering platform at the stern is seen to be present and in all a fighting-top is perched at the upper end of the mast of each ship to accommodate several archers, although only one is shown, probably a convention, as it might be difficult to show more than one occupant in the small space available to the sculptor.

All the ships are shown as single-masted galleys, with the sides of the underbody heightened by the addition of a deep screen-like washstrake which served also to give some measure of protection to the rowers, who were probably captives condemned to servitude in these war galleys. These men rowed from benches or thwarts all placed on the same level ; the days of biremes had not yet dawned.

Mast and sail. The masts of all the ships, friend and foe alike, were stepped amidships; they were vertical and rigged with a simple square-sail suspended from a slightly bowed yard, slung horizontally on the mast. Prepared for battle action, the sail was furled to the yard by means of brails.

Steering was after the fashion usual in the larger craft of the New Empire; a powerful quarter oar was slung on each side, from a tall steering post on the quarters, its rotation governed by a tiller worked by the steersman standing on the stern platform. The tiller end was in the form of the head of one of the many deities of the Egyptian pantheon; the hawk head of Horus was probably the one most favoured, but this depended mostly upon the nome to which the vessel belonged.

In one of the side chambers not far within the entrance to the tomb of Rameses III in the Valley of the Kings at Thebes, there are several representations of the gaily bedecked boats used by royalty and the nobles upon the Nile at this period. They are shown as sailing boats gorgeous in the bright colouring of the hulls and of the embroidered sails. Probably they were decked craft, for the ends of cross beams are shown passing through the planking of the sides just above immersion level; these are likely to have supported a decking of planks on which a throne, or in other instances, a pavilion was placed. No rowers are shown, all the boats being painted with their sails set to catch the favouring breeze. Instead of the moderate hull curvature seen in the war-galleys of Medinet Habu, these Nilotic craft have their hulls of a deeply crescentic curvature along the bottom with the gunwales only slightly less curved or sheered.

In one example the sail is of a chequer-board pattern, margined by a border of three colours of chevrons; from both the prow and the stern there hangs an embroidered cloth of semicircular form, its design reminiscent of the elaborate collet of diversely coloured beads or semi-precious gems worn by the nobles of Ancient Egypt; these trappings overhang and conceal the actual extremities of the hulls, which are painted in handsome, bright colours deriving their motive from the circular terminal lashings around the ends of the ancestral papyrus bundle-canoe. In some boats the stem and the stern are bifid and shaped in the form of a pair of horns curved outwards; in others, the stern sheers sharply upwards to a considerably higher point than is the stemhead and in these the fore-end is slightly notched.

On the bows of some of these boats the eye of Horus is painted while at the fore-end, a slender-bodied dog is displayed on a stand, the emblem of the nome to which the owner's domain belongs; in modern boats this figure would be replaced by a flag recognized as the territorial emblem of a country or of some high-ranking personage.

These vessels were steered as already described by a pair of quarter-oars or primitive rudders. In the fourth alcove on the left after entering the tomb of Rameses III, the walls are decorated by a series of wall paintings of these steering oars, alternating with serial rows of figures of sacred cattle. The loom is banded alternately with broad circles of green and yellow, while on the broad parallel-sided blade are painted leaves of the lotus, the Horus oculus and geometric rosettes in serial order. The most striking feature is the curious form given to the tiller; this represents the curved body of a cobra with the head bearing the tall white crown of Upper Egypt of which Thebes was the centre.

A number of the boats painted on the walls of this tomb have a sail of rather different shape and embroidered pattern. Instead of being tall and of less width than height, the sail in these boats is wider than high, probably because in these a tall pavilion erected on the deck amidships, would interfere with the efficient functioning of the other type of

NAVAL ACTIVITY IN THE DAYS OF SOLOMON AND RAMESSES III

sail. In the pattern of this sail the chequer design is replaced by transverse rows of geometric forms alternating in two registers with figures of sacred birds. The foot of the sail is fringed with long tassels which add considerably to the luxurious elegance of the decorations. But luxury is conspicuous in every detail; a broad striped streamer fluttering from the upper end of the tall rudder serves as a wind vane and the walls of the fore and the after erection (their function difficult to determine) are decorated by figures in rich colouring.

The descriptions in the foregoing account indicate conclusively that in the reign of Rameses III, naval design in Egypt had attained as high a level of design as any that was then known in the surrounding maritime countries of the Levant, conditioned however by the fact that in Egypt, the greater part of water transport was of an inland nature, secure against many of the dangers attendant upon navigation in the open sea. But as already noted, it required the combined attack by hordes of marauding sea-rovers upon the exposed coastal towns of Egypt to awaken that country to the urgent need to revive and improve its naval power. As happened under comparable conditions in England in Saxon times, when raids by Danish freebooters were common upon the coast of East Anglia, the advantage turned in the end in favour of the invaded country when an able leader appeared, determined to copy and improve upon the war vessels and naval technique of the enemy. In Egypt the man who accomplished this, as we have seen, was Rameses III, who thus anticipated the parallel activities of King Alfred of England in his campaigns against the Danish invaders.

But while Rameses was building fighting galleys for service in the Mediterranean, the water craft of the waterspreads and marshes remained as primitive as in predynastic times; these inland skiffs, as we see them painted on the walls of many tombs of this period, continued to be built of bundles of papyrus reeds or of ambatch branches, the hulls thus formed being secured from becoming sodden and waterlogged by some form of protective coating, either a mixture of lime, oil and dammar as used today by Indian and Arab seafaring people, or by an application of melted bitumen or asphalt as still practised by the marshfolk of Iraq.

Before the time of Rameses III, the only important and large sea-going craft seem to have been the trading vessels engaged in commercial voyages in the Red Sea; these were mostly of a coasting nature but from time to time special ships were built for the long voyage to the land of Punt in quest of ivory, incense, spices and other luxury articles to be found in the coastal marts of Somaliland and Southern Arabia; in these, besides the products native to these places, others brought from India were often to be found on sale or for barter at Aden, already a great emporium where goods from India and pearls from Ceylon were exchangeable for the products of Egypt and the Levant.

Richly laden with the riches of the East as were the Egyptian vessels returning from Punt, it is probable that rumour vastly exaggerated their quantity and their value. To these stories we may trace the sudden eagerness of King Solomon, greatest of the Hebrew sovereigns, to obtain a large share in these richly rewarded voyages to Somaliland and Southern Arabia. The result was that this monarch, Solomon the Magnificent, decided to form his own sea-going fleet to participate in the rich trade opened up with India and the Far East.

Lacking both the timber requisite for the construction of suitable ships large enough to carry remunerative cargoes and shipwrights skilled enough to build them, as well as mariners of sufficient experience to navigate the ships when built, Solomon applied to his friend and ally, Hiram, King of Tyre, for assistance. We read in the Book of Kings, vi, 26-28, that

ANTIQUITY

' King Solomon made a navy of ships in Ezion-geber, which is beyond Eloth, on the shore of the Red Sea, in the land of Edom. And Hiram sent in the navy his servants, shipmen that had knowledge of the sea, with the servants of Solomon. And they came to Ophir, and fetched from thence gold, four hundred and twenty talents, and brought it to king Solomon '.

The richness of the cargoes obtained in Ophir is attested by the statement in the next chapter, verses 21 and 22, where it is stated :—

' And all king Solomon's drinking vessels were of gold, and all the vessels of the house of the forest of Lebanon were of pure gold ; none were of silver : it was nothing accounted of in the days of Solomon. For the king had at sea a navy of Tharshish with the navy of Hiram : once in three years came the navy of Tharshish, bringing gold, and silver, ivory, and apes, and peacocks '.

From these quotations it is evident that for some indeterminate length of time these voyages to Ophir were regularly undertaken, each taking some three years for the round trip. Where Ophir was situated has for long formed the subject of debate. My own well-considered conclusion is that it was none other than a great mart on the west coast of India, where the produce of the gold mines of Hyderabad, of the spice lands of Malabar, and of the gem-workings and pearl-fisheries of Ceylon, were collected by merchants to meet the foreign merchant-king's requirements, just as, at a later age, this role of commercial emporium was occupied first by Broach and later by Surat.

Before the time of Solomon, Saba, the biblical Sheba, occupying the south-west corner of Arabia and comprising Aden and Musa (Mocha) among her ports, was the country where the ships of Egypt, India and Ceylon and those of Java and distant Madagascar, foregathered for the exchange of goods. If so, it is a fair inference that Solomon's ' wisdom ' in equipping a fleet for direct trade with India, had the elimination of very greedy middlemen in the persons of the Sabaeans traders as its mainspring of inspiration. It is perhaps significant that the prophet Ezekiel in his ' Dirge of Tyre ', enumerated among the merchants who traded in her markets those of ' Sheba with spices, precious stones and gold '. Of these, spices are not typical products of Arabia, and if Saba bartered them with Tyre, it was as a trade-intermediary between Tyre and India. The Greek historian Agatharchides, the contemporary of Ptolemy Philometor (181-146 B.C.) bears witness to this, for he describes Saba as owing her importance and great prosperity in large measure to the monopoly she enjoyed of trade with India. He states having seen large vessels which had come from Potana (Potala) on the Indus, and makes mention of the great numbers of Indian merchants who resorted to Sabaeans ports to sell and barter their goods to the Sabaeans merchants, who, in turn, sold them to the Egyptians and Greeks at great profit.

That the Ophir to which Solomon sent his fleet every three years was situated on the west coast of India rather than at some place on the south Arabian coast or on that of Somaliland, receives confirmation from several cogent facts and considerations. The first and most important is, that of the goods sought, the great majority were to replace those formerly purchased at middlemen's high prices at a Sabaeans port, probably Aden. These were mainly spices, precious stones and gold (Ezekiel, xxvii, 22), all commodities obtainable in India and Ceylon, whereas neither in South Arabia nor in Somaliland are any of these products to be found, so far as I am aware in paying quantities.

For many centuries gold mining has been a source of great wealth to India. At least two centres are known in India where gold is or has been mined in considerable abundance. The one at present in active production is situated at Kolar in Mysore ; the second, evidenced by many* and extensive abandoned underground workings, was

discovered during the present century by mining prospectors in the Raichur District of the Hyderabad State.* In the immediate neighbourhood of this centre, many fragments of highly ornamented chank bangles and other evidence of former wealth have been found* attesting the former existence in this gold-mining region of a wealthy community able to indulge expensive tastes. With gold abundant and money in active circulation, even if the actual miners were little better off than slaves, articles of luxury would be in great demand; of these, chank bangles certainly figured largely to judge by the great quantities of waste chank fragments present. That this demand was backed by much wealth, is demonstrated when we consider that it led to the establishment of an industry (chank bangle manufacture), dependent upon raw material imported from a coastal district hundreds of miles away—either from the north of Ceylon or from a port on the southern Coromandel coast of India. This material would have to be carried by sea to the mouth of the Kistna and thence conveyed by river craft to its destination in the west of the Nizam's dominions.

The conclusions to be drawn from the foregoing considerations are that while Punt was situated either in Somaliland or in Southern Arabia, Ophir was a coastal emporium of Western India, whence were shipped abroad some portion of the gold mined in the Raichur mines, together with spices from Malabar, pearls and perhaps cinnamon bartered by traders from Ceylon.

Another strong indication that Ophir was an Indian port is the statement that the length of time occupied by the Ophir trading fleet to make the round voyage is recorded to have been three years. This period is evidently a rough approximation to what is likely to have been the usual length of time requisite for the voyage, seeing that, so far as possible, the shipmasters would prefer to make the whole journey coastwise in place of pushing out boldly to their destination on a direct course across the Indian Ocean. The time occupied in bargaining and in waiting for delivery of the gold purchased, would be considerable for any large amount of gold would have to come by armed convoy from inland over a land track which had to negotiate a difficult passage over the Western Ghats; this loss of time has therefore to be added to the actual time taken on the outward and homeward voyages. Conversely, three years is too long a time for the accomplishment of a return voyage from Egypt to Somaliland, even if gold had been obtainable either there or from Arabia, which is not the case.

Two conclusions we may consider proved from a consideration of the facts at our disposal: (a) that Ophir could not have been situated either in southern Arabia or in Somaliland and (b) that Punt must be located in one or the other of these two localities seeing that incense trees are not to be found in India, whereas they are to be found in the lands immediately beyond the southern entrance to the Red Sea.

*Hornell, J., *The Chank-shell Cult of India*, ANTIQUITY, June 1942, p. 130.

Etruria from the Air

by JOHN BRADFORD

A CENTURY has just elapsed since the now famous Regolini-Galassi tomb at Caere (Cerveteri) was opened by the Archpriest and General whose names it bears. The beautiful proportions of the silver vessels, the delicate goldwork, and the impressive design of the bronzes, which together formed the sepulchral furniture befitting an Etruscan nobleman of the middle 7th century B.C. came as a *coup d'éclat* to the academic world, and can still be considered the most splendid ornament of the Museo Etrusco Gregoriano at the Vatican. But the most obvious significance, today, of this centenary is to recall the early history of field-archaeology in Etruria and the problems that have been inherited from it, of which one of the most essential still remains to be dispatched; namely, the preparation of accurate plans of the cemeteries. The difficulties inherent in this are very clearly illustrated by the circumstances (1) of the Regolini-Galassi discovery and by its consequences. It immediately stimulated extensive excavations for collectors' trophies at Caere, where the necropolis until then had largely escaped the attentions of early antiquarians and treasure-hunters; activities that at Tarquinia have been characterized as 'tumultuosi' by Prof. Nogara, and whose story has been summed up by Prof. Pallottino as 'singolare e dolorosa insieme'. Throughout the 19th century the acquisition of quantities of museum material from Etruscan sites continued and was intensified, and its classification by typological study (which was then especially the vogue in European archaeology and science generally) served to increase (2) immensely the knowledge of the tombs' structure and furniture. But the problems of the detailed plan of any single necropolis were never squarely faced. The excavations sponsored by the State during this century, notably those of Mengarelli at Caere, have of course given us orderly plans of the areas examined, but attention has been usually, and rightly, concentrated on the thorough excavation of one particular monument or limited area within a necropolis, with the result that it has remained difficult to obtain any clear idea of the general plan, or lack of it, over the whole site.

It is to this field already so intensively tended by scholarship that we must summon the technique of Aerial Photography; probably the most important extension of applied archaeology since the adoption of scientific method in excavation. Appropriately, it has fresh facts of permanent value to provide, on precisely those questions where they are most needed, i.e. the number, location and siting of a large proportion of the architectural

¹ According to Randall MacIver (*Villanovans and Etruscans*, p. 195), 'No outside observer was present during the 24 hours of feverish activity which sufficed for the clearing of the tomb. No journal was kept, no observations or records were made on the spot and it is not surprising that there has been endless error and confusion'. Thanks largely to the labours of Pinza, a detailed inventory of the probable original contents of the tomb was arrived at, 70 years later.

² The names of the distinguished archaeologists from Italy and other countries who achieved this result, and their separate contributions, have been summarized for those who study the history of our subject by Prof. B. Nogara, 'Gli studi etruschi negli ultimo cento anni', in *Boll. Università Ital. per Stranieri di Perugia*, 1939, 3-31; but the same author's comments in *Gli Etruschi e la loro Civiltà* and Pallottino's in his *Etruscologia* are more generally accessible.

tomb structures within Etruscan cemeteries. With their distribution mapped, one is also in a position to determine the course of future excavation with precision and to assess its potentialities in relation to the depredations of the past. It is by no means a simple problem. Many of the tumuli once opened were soon forgotten, their sites unrecorded and later excavated afresh. The resulting disorder was cumulative, but it is only just to add that a properly surveyed plan of a necropolis like the Monterozzi at Tarquinia, on to which separate discoveries could be plotted, was almost beyond the powers of any private individual, save perhaps someone equipped with resources, determination and devotion to accuracy equal to those brought to bear by General Pitt Rivers on his Cranborne Chase estates. Gallant efforts have been periodically made to condense and co-ordinate the scattered references to casual exploration in the past with which the literature teems; and much of the confusion about the location and construction of individual tombs has been cleared up by *literary* spade-work rather than by field-work. At the end of the 19th century Pasqui did what he could at Tarquinia, and no praise can be too high for such painstaking and monumental redaction as that accorded by Prof. Pallottino to this site. Reconstruction from written sources, however, was naturally limited by the inherent incompleteness and inadequate presentation of the material which it sifts and the inexact observation on which these accounts were only too often based, thus forming a vicious triangle.

To the best of my knowledge no series of air-photographs of an Etruscan necropolis has yet been published, although Professor Mancini has very kindly shown me examples of verticals and obliques of Caere taken by an Italian aircraft before the War (see below, p. 80). Theoretically such sites (3) should lend themselves to the employment of this technique especially well by the very nature of their composition. This inference was fully confirmed during the war by photographs taken by the R.A.F., although flying-conditions were naturally not exactly those which would be chosen for the best archaeological results! But the skill of the pilots and the excellence of the cameras was such that, in fact, large numbers of valuable archaeological discoveries were made from photographs taken under conditions of altitude (4), etc., that would have been considered out of the question for this purpose before the war. Fortunately, the requirements of research asserted themselves sufficiently at the time to prompt me to take note of the most informative air-photos of the major Etruscan sites. As a result, examples from Caere and Tarquinia as well as a third probable necropolis not previously identified have been selected for illustration; having been granted a security clearance, they were sanctioned for publication by courtesy and permission of the Air Ministry.

³ i.e., Proceeding from the ascertained principles of cause and effect that produce soil-marks and crop-marks, which were tested and shown to be valid on a variety of soils in England. These principles were recently re-stated clearly by Riley in *Arch. Journ.*, 1944. Before the war several Italian archaeologists, notably Professor Lugli, had appreciated that the results obtained by Crawford and Poidebard, under very different circumstances, had a general application within a wide range of terrain and vegetation conditions. See Lugli, 'L'importanza del rilievo aereo negli studi di topografia archeologica', in *Atti del V Congresso Nazionale di Studi Romani*; and also *Saggi di esplorazione archeologica a mezzo della fotografia aerea* (1939).

⁴ In the clear weather that prevails for most of the year in Italy, crop-marks can be photographed from heights of up to 5 miles with excellent results when using an ordinary modern 36 inch focal-length air-camera. There is little doubt that, even in British weather, archaeological (vertical) air-photography can and should operate at very much higher altitudes than those used before the War, because of the economy effected by the great increase in the amount of ground thus covered by each photograph. Low verticals and low obliques would be the final stage, on pre-selected sites. There are big gaps in our distribution maps; let us try to fill *them* first.

It will be appreciated that the air-photographs of these sites have a threefold function; firstly, to discover new tombs (5) and to aid the re-identification of those uncertainly located; secondly to provide new details of planning and relationship, e.g. new *vie sepolcrali*; and thirdly to show in plan form, to a known scale, the picture of the tomb-distribution as a whole. The last is the most valuable aspect, because no complete plans or even adequately satisfactory plans of this description have yet been published for these cemeteries. It will scarcely be necessary to mention that an exact scale can be worked out for a vertical air photograph as for a map, but it should be added that measurements correct to about two feet are normal after some experience with a micrometer scale, and where the condition of the object permits such accuracy (the 'spreading' of ploughed-down *tumuletti* is one obvious difficulty). But, under reasonably favourable circumstances, a measured plan of the largest necropolis can be made rapidly from air photos, to include the positions of those tumuli now levelled that are imperceptible at ground-level (or from the 'cat's-eye view of the carpet', in Crawford's vivid phrase). From the air, under suitable conditions, even the outline of their form may become clearly defined (see Plate I). They can be revealed by several different sets of physical circumstances, either (i) by localized parching in crops or grass causing circular light-toned patches (PLATE I, Caere), or (ii) as soil-marks, i.e. abnormalities in the composition of the top-soil, due (in the instance of tumuli) to the increase in the proportion of stony rubble from the ploughed-out mound in comparison with the ordinary ground all round; in such cases the tumuli appear photographically as prominent points of high-light of varying size but roughly circular (e.g. PLATE II, Tarquinia, and PLATE III, Colle Pantano). These plates will demonstrate the rich potentialities latent in the aerial photography of such sites, always provided that the interpretation of the evidence that they furnish is of a high scientific standard. We may expect even more important discoveries when it is possible to arrange for a flying-programme directed, for the specific needs (6) of our subject, by an archaeologist experienced in the interpretation of crop-, and soil-, mark sites.

I have found that the examination of stereoscopic pairs of air-photographs is of the greatest value in the positive identification of ploughed-out tumuli, whose almost levelled mounds 'lift' just perceptibly under the stereoscope thus giving the effect of 'a visual model in 3 dimensions'. The fundamental importance of this method of examination lies in its vivid presentation to the eye of the earth's surface in correct relief; thereby developing in the mind an abnormally acute 'feeling' for terrain, until every fold and gradation of surface count towards building up the character of a site. Before the war all this was a commonplace in aerial mapping, land utilization surveys, etc., but was not fully developed in archaeological air-photography.

It should be emphasized and re-emphasized that provision for stereoscopic examination is from now onwards a *sine qua non* in the application of aerial-photography to all

⁵ i.e., Tumuli and those forms of *tombe a camera* that are nearly free-standing. But Mengarelli (*Studi Etruschi*, vol. I, p. 148) stated that the *tombe a fossa* and the *pozzetti* at Caere had a distinctive stony filling, and so under favourable conditions they might, in a group, give a collective soil-mark. Photographs of the excavations (op. cit., Tav. XII, XIII, XVII) suggest that the increased depth of soil over a wide area which results from their concentration in large numbers could also produce a crop-mark; such a zone might appear as a large irregular patch differing from its surroundings.

⁶ Traces of Etruscan buildings in the former city areas have not yet come to my notice, but no doubt a technique of air-photography can be evolved to meet this special problem; possibly low-obliques taken looking towards a setting sun would disclose the course of walls, etc., in the form of 'shadow-sites'.

environmental studies. It is easy to gain the impression that one can wring the maximum out of a single photograph examined with magnification (7), but this is entirely deceptive ; for in the country of the one-eyed, the man with both is king. War-time experience has led to the growing realization that a continued acceptance of single air-photographs as the standard practice in archaeology would be a seriously retrograde step in a country which has pioneered this aspect of archaeological technique. The kind of stereoscope required for archaeological purposes is one of the simplest pieces of apparatus in scientific use. Everything turns on the type of air-camera and its installation in the aircraft so that the photographs may be taken in the proper manner. It has been reported (8) by Dr D. A. Spencer (who was Principal Scientific Officer in charge of photographic research and development at the Ministry of Aircraft Production during the war) that the British Ecological Society has circulated 'a memorandum to scientific authorities and responsible government departments recommending the establishment of an aerial unit for scientific work'. It is earnestly hoped that this proposal will be supported by British Archaeology with the greatest vigour.

It was inevitable that War should bring far-reaching improvements in air-photographs, and it is no exaggeration to speak of a revolution in their quality, scope and production. 'We have accumulated considerable experience with a powerful tool of research and it remains for us to adapt it to the same requirements of peace (9)'. If vigorous and imaginative use is to be made of these improvements it will only come as the result of a co-ordinated programme of aerial research in which Archaeology, Geography, Geology, etc., co-operate. Though the needs of each are specialized, it would seem that most of these could be met by a good set of stereoscopic (vertical) photographs at a scale of 1:7-10,000 (i.e. the same scale as PLATES I, II and III B).

The chosen illustration of Caere (PLATE I), which shows a highly complex site in some detail, suggests that this war-time evolution in air-photographs demands some corresponding change in attitude towards them. They have of course ceased to be regarded in Archaeology as a freakish experiment, but there is now a possible danger that wider diffusion may cause the interpretation of their evidence to be undertaken too casually. They necessarily suffer in reproduction, and, as discussion of debatable points should take place over the original prints which may not be easily obtained, this gives a particular importance to the first interpretation. In future, increasing numbers of people will be handling them for the first time, and, although the dead hand of *expertise* should play no part, it is important to remember that air-photographs are technical documents and deserve to be treated with the consideration due to a new form of public record demanding the observation of its proper canons of accuracy (10).

⁷ Even when examining crop-marks, which have no height themselves, stereoscopy is of the greatest assistance especially where their outline is faint, because the original ditches which they represent were usually adapted to the terrain ; and when they are not (e.g. with the crop-marks of Roman centuriated fields in Apulia) it is still a considerable advantage to be able to see them magnified with both eyes at the same time.

⁸ *The Geographical Magazine*, February 1947, 'Air Photography and Geographical Research', p. 430.

⁹ *Ibid.*, p. 439.

¹⁰ *Ibid.*, p. 438, 'The amount of information that an interpreter can extract is directly proportional to his experience. This in turn is dependent on his understanding of air-photographs as a source of information, his knowledge of the subject studied and access to a series of photographs of the same area taken on earlier occasions'.

CAERE (PLATES I and III A)

Caere—and the present Cerveteri—lies roughly 20 miles NW of Rome on the bare angular downs overlooking the coastal plain of the Tuscan Maremma. The Etruscan city was as large as Veii; little is known of its internal plan but it crowned a steep-sided, flat-topped ridge and covered about 375 acres. Its great cemeteries round about covered an estimated 675 acres (not counting outlying graves), and it is the chief of these—that called Banditaccia (11)—with which we shall be most concerned. The site was a long narrow plateau similar to and parallel with that occupied by the ancient city, and is highly complex with an uninterrupted succession of tombs throughout the Italian Iron Age into the Roman period. For 25 consecutive years from 1911 Prof. Mengarelli pursued his excavations there with method and enthusiasm, and even so only a limited proportion of the site was investigated. The measured tread of academic prose does not fully convey the impressive appearance of the rows of tumuli bordering the great *via sepolcrale* within the area cleared. But there is little or nothing to be seen on the ground along the edge of the necropolis overlooking the Fosso del Manganello where air-photography (PLATE I) reveals the presence of a very large number of tumuli. These have been levelled by agriculture. A century ago according to Mrs Hamilton Gray (12) the tableland was 'full of caverns and burrowed with holes' and Dennis called it 'a singular place—a Brobdignag warren studded with mole hills'. Both were struck by the great wanton damage to the site that proceeded under their eyes, which to the former made it appear as if 'sacked by plundering banditti'. This was largely due to the continual depredations of peasants busily quarrying the tumuli for blocks of dressed stone, etc.

The major discoveries which result from the air-photographs are:—

- (1) The positive identification of the exact position of 250–300 tumuli which have not appeared on any previously published plan.
- (2) The location of two important *vie sepolcrali* and several secondary branches.

These were revealed by photographs taken on 14 May (PLATE I, 1:8500). Earlier, on 9 March, the same features were visible but much less clearly. The tumuli appear as small circular light-toned grass-marks and crop-marks, most sharply defined along both edges of the plateau where soil is thinner and the effects of parching therefore more pronounced. The *vie sepolcrali*, deeply cut in the rock, are disclosed by the

¹¹ There is no satisfactory published plan of the whole of this necropolis. There is a diagrammatic sketch-map on the cover of the Cerveteri booklet (1940) in the *Itinerari dei Musei e Monumenti d'Italia* prepared by Prof. Pallottino, and a small-scale map of the site in relation to its environs by Prof. Mengarelli (*Studi Etruschi*, xi, Tav. v) at 1:60,000 (roughly 1 inch: 1 mile) which shows the suggested limits of the cemeteries by shading but is not intended to be a detailed plan. However, in the Museum on the site there is a valuable large-scale plan of the Banditaccia necropolis, and Professor Mancini (*Soprintendente alle Antichità* for Southern Etruria) has very kindly informed me that a full publication (with plans) of the areas so far excavated is in preparation by his department, and is to appear in *Monumenti Antichi*.

¹² *Tour to the Sepulchres of Etruria* in 1839. She made her target 'Intelligent Englishmen . . . who drawled out that perhaps upon the whole these were worth visiting'. 'I write for the ignorant and pleasure-loving traveller, and not for the learned and antiquarian'. This is not the language of the Grand Tour of the preceding century but of the educated middle-class beginning to travel from curiosity. Her archaeological chronology was that of her day, but her personal observations, e.g. on contemporary methods of excavation (see below, note 15), are interesting because objective.

opposite cause ; the extra depth of soil conserves the extra moisture for the vegetation on top which is consequently darker in tone. One of these (A-B) is strikingly apparent ; it can be traced for *c.* 670 yards and has a short branch at right angles to *c.* 65 yards long. Another at D is seen to run for 140 yards, but further photographs show that it continues beyond this point. There are also portions of *vie sepolcrali*, about 80 yards long, visible at E and F. All of these are flanked with tumuli.

PLATE I shows a densely packed zone of tumuli to a depth of at least 160 yards all the way down the east side of the plateau, and another big concentration on the west side. For ease of reference I have divided these into seven groups. The largest of these, Group R, contains 70 tumuli which can be identified with certainty (13) on the original photograph, plus a probable 30 which could be confirmed by trial trenches or more air-photographs. The total number of newly discovered tumuli, imperceptible on the ground, can be summarised thus :—

Group	R	..	Certain	..	Probable
			70		About 30
"	S	..	18	..	" 5-10
"	T	..	45	..	" 5-10
"	U	..	30	..	" 10
"	V	..	30	..	Numerous, ? 20-30
"	X	..	20	..	Numerous, ? 20
"	Y	..	45	..	" 5-10

In groups R and U, rows of tumuli in a rough general alignment are common, with rows of up to 9 and 7 in each respective group. Careful measurements from the photographs give diameters of between 20 and 50 feet for the great majority in all groups, with most nearer the larger figure. Probably many were the semi-subterranean *tumuletti arcaici*, which have a small burial chamber partly excavated in the rock with an artificially built-up roof (ogival section) of stone blocks, covered by a mound.

The plan and section of a typical example are shown in *Studi Etruschi*, I, Tav. XIX A ; and an excellent ground photograph of their external appearance when excavated is given on p. 40 of Pallottino's booklet (1940) in the *Itinerari dei Musei e Monumenti d'Italia*. They were numerous in the 7th century B.C. as the prototype of the larger and more complex forms of tumulus which reached their fullest development in the 6th and 5th centuries, and thereafter enjoyed a rapidly declining vogue.

The position of the entrance gallery is also clearly seen (PLATE III A) as a short dark gash within many of the newly-found tumuli. Some have several and it was observed by Prof. Mengarelli that, usually, such a group of tombs in one tumulus will not all belong to one period.

The foundation from which these tumuli rise is a free-standing cylindrical 'drum' cut out of the natural tufa to a height of several feet, round the top of which courses of oblong blocks were sometimes added, whereon the earth was piled at the angle of rest to form a conical mound. When this mound is levelled, as it has been in all these cases, the edge of the drum's circumference ought to be sharply demarcated in any crop-mark, and this is shown to be so. It is therefore believed that measurements of the diameter of tumuli from good crop-marks should prove accurate.

I have chosen several clearly defined examples as representative of those below ground (see PLATES I and III B), viz :—

¹³ In the area which includes my Group R, Prof. Pallottino reports only 'sepolcri sparsi'.

ANTIQUITY

		<i>Approx. diameter in feet</i>	<i>Entrance galleries</i>
No. 1	.. ..	48-50	One
No. 2	.. ..	77-80	One, (?) two
No. 3	.. ..	45	One at least
No. 4	.. ..	60	Probably two, (?) three
No. 5	.. ..	124 (14)	One, probably two
No. 6	.. ..	82	Four, (?) five
No. 7	.. ..	38	One

Out of six low-oblique air photographs of this necropolis taken by an Italian aircraft before 1939, and generously shown to me by Prof. Mancini, only one gives any hint of the crop-marks discussed here. But a mosaic of vertical air-photographs (flown on 1 May 1935, with scale 1:9300), of which a copy reduced to about 1:30,000 has also been courteously sent to me by Professor Mancini, confirms even at that small scale the existence of the new tumuli reported above. On it one can also see the grass-marks of other levelled tumuli farther along the Banditaccia plateau, and also others bordering a prominent *via sepolcrale* towards the south end of the Monte Abetone ridge. This is known to have been the site of a necropolis and the counterpart of the Banditaccia, but faces the opposite side of the Etruscan city.

TARQUINIA (MONTEROZZI)

This necropolis—perhaps the largest in Etruria—lies 45 miles NW of Rome. The cities of the living and the dead anciently confronted one another across a deep valley, from parallel ridges which rise from the back of the coastal plain as at Caere. The position was a favourable one for a city state that was both a land and sea power. The Monterozzi ridge is wedge-shaped, tapering to a point on which lies the medieval and modern town; its necropolis is of much greater length than the Piano di Civita opposite and extends for no less than two miles from the outskirts of the present Tarquinia to Secondi Archi, with an almost certain addition of a further half-mile towards Pisciarelllo. We shall concentrate on the central sector of this necropolis. It is for the most part bare arable, but there are three convenient fixed points of reference, Primi Archi, Arcatelle and Secondi Archi (see PLATE II), the remains of a medieval aqueduct. 'The whole surface is rugged with tumuli' wrote Dennis 'giving it a strange pimply appearance'; thence comes its name.

The evolution of the Monterozzi necropolis and of the small scattered cemeteries on hillsides round the ancient city, have been reconstructed with the most commendable care by Prof. Pallottino (*Monumenti Antichi*, xxxvi, 1937) who divided the history of their exploration into 3 phases. (i) Unorganized and improperly recorded digging persisted until the early 19th century. The site was long exploited as a convenient source of wealth; for instance, in 1546 Cardinal Farnese collected 6000 lbs. of metal in antique objects towards the decoration of St. John Lateran. At the beginning of the 18th century the wonderful novelty of the painted tombs produced 'an unlooked-for frenzy of exploration'; the activities of the local antiquaries, and of others attracted from abroad, are today chiefly studied for their illumination of this nascent phase in the History of Archaeology. (ii) c. 1823-81. Private and communal excavations lacking a plan or a

¹⁴ The largest tumulus in Prof. Mengarelli's excavations (= his 'Tumulus II') measured c. 130 feet in diameter.

strictly scientific account (15); Dennis notes that although they were carried on 'pretty briskly', the yield of important objects to repay the cost was rapidly declining. In 1839 Avvolta estimated that about 2,000 'sepulchral deposits' had been explored in the previous year. Pallottino sums up this phase by observing that in the main the necropolis was treated as a quarry for museum specimens. (iii) Post-1881. State-organized excavations.

The absence of a general plan of the site continued to be felt throughout most of this third period, and imposed obvious limitations for instance on Åkerström's discussion of the distribution of tomb types here in his *Studien über die Etruskischen Gräber* (1934). It was not until 1937 that this gap was filled by the sketch-plans (16) in Prof. Pallottino's publication, based on the monuments recognizable at eye-level today and as many of those previously recorded as can be now identified. In view of the immense difficulties in mapping so large an area as the Monterozzi necropolis, some inaccuracies were bound to creep in; and it is worth pointing out those revealed by vertical air-photographs (PLATE II) which themselves supply the basis for a comprehensive site-plan with a very high degree of accuracy and detail. There are a few necessary emendations to the topographical frame-work (17), but the distribution of the tumuli is of more immediate concern. It has not been possible to reconcile the positions of the eight large ones half-way along the Strada Carrarecchia from C. Santiloni to Arcatelle with those of the greater numbers made visible on the air photographs. There seem to be inaccuracies in their relative positions. Similarly, the dense crowd of tumuli now revealed NW of Secondi Archi makes it difficult to identify the individual tumuli shown by Prof. Pallottino in this area. Of course they are there, but not in splendid isolation. In this work of literary reconstruction Prof. Pallottino was perfectly aware of the misleading impressions that could be created. Of the Arcatelle area he wrote, 'Here, also, the lack of precise indications for the most part forbids topographical identification of the tombs discovered and described; so that the archaeological plan is constrained to silence, when it should in reality be nearly black with distribution spots'. PLATE II amply demonstrates how correct is his opinion.

The chosen air-photograph was taken on 16 February 1944. In the cultivated fields along the top of the Monterozzi ridge can be seen great numbers of light-toned patches, which are soil-marks amidst the young corn. A visit to the site in 1945 confirmed that the paler patches were due to an increase in the stony rubble on the surface at these

¹⁵ Mrs Hamilton Gray gives an interesting eye-witness account of similar proceedings at Veii in 1839. 'The foreman of the labourers took his pick-axe and struck the ground in many places but it resounded to the tufa'. Eventually 'the foreman found the earth deep. He then searched about until he came upon tufa and distinctly traced upon the grass the part where the tufa and soil met upon the upper line of a door'. Filling-in might have to be done the next day to restore the land for sheep grazing. 'When this generation has passed away, what is there to preserve the memory of the ground they hired, searched and filled in again . . . and who is to say what was found in any particular tomb . . . or what ornaments are contemporary and were found together?' (op. cit., p. 93).

¹⁶ *Monumenti Antichi*, xxxvi, Tav. IV-VI at end of volume; see his column 45, footnote 2 for the impressive list of authorities used.

¹⁷ e.g. (i) The track (*viottolo*) between Arcatelle and Secondi Archi, which is an important landmark, is straight and has no change in direction midway. (ii) The edge of the escarpment (*ripa calcarea*)—whether the top or bottom is represented—shows a number of discrepancies. (iii) The line of the East arm of the Y-shaped valley (known to have been a *via sepolcrale*) running from Arcatelle to the Strada Provinciale is much more irregular than is indicated on Tav. VI.

points, and represent the ploughed-out mounds of tumuli which probably had been built up from the material excavated from round the foot of the foundation-drum. They are in no way connected with farming activities or earlier excavations. Although the presence of such stony spreads is clear on the air-photographs, they are *per se* impossible to measure exactly (18) as they shade off gradually into the normal texture of the undisturbed earth; and thus are far less helpful than the grass-marks at Caere. These soil-marks were still very clear on 29 March, but on 31 May the crop's growth had not improved matters, and curiously enough there did not seem to be any 'parch-marks' as there were at Caere on 14 May in the same year. Between Primi Archi and the town there was little to be seen except a few suggestions of small tumuli and south of the Strada Provinciale in the olive plantations, there were no certain discoveries even in the neighbourhood of the outlying Tumuli della Doganaccia. Practice makes it possible to distinguish the abnormal from the normal surface phenomena like patches of out-cropping rock, marks made by corn stooks, etc., and to reject these latter.

Between the east wall of the cemetery near Primi Archi and Secondi Archi—a distance of about 1650 yards—the soil-marks of no fewer than 575 (19) tumuli, large and small have been counted on PLATE II; and the number of probables adds substantially to this figure. The certainties can be subdivided as follows. (i) 85 on the north side of Strada Carrarecchia, between the cemetery and Arcatelle; these include several large tumuli near Casa Santiloni which do not appear on the published plan. It is no longer so necessary to say of this area 'We must be satisfied to place the monuments in a more or less vague zone outlined with the greatest approximation'. (ii) 65 on the south side. I have already referred to the difficulty in identifying the eight large tumuli shown on Pallottino's Tavola v with the larger numbers on the ground revealed on PLATE II. (iii) 210 on the north side and 215 on the south side, of the *viottolo* between Arcatelle and Secondi Archi. Ploughed-out tumuli are so numerous that they give the appearance of a snow-fall. A few of the largest (e.g. x, y, z) are shown by Pallottino who indicates three *Zone di Tombe* in this area, but the vast majority are located for the first time. Some 'lift' slightly under the stereoscope, which was found very useful in their examination. The big gaps on Pallottino's Tavola vi on the south side of the *viottolo* are now filled. Between Arcatelle and the Strada Carrarecchia the soil-marks are faint, but a number of tumuli can be identified nevertheless.

This photograph, however, would give no indication of the former existence of several hundred archaic *pozzetti* graves grouped together near the rocky outcrop marked at M. It is not in any way claimed that aerial photography alone is self-sufficient to plan a site of this kind; it must be combined with much field-work (probing with a rod, trial-trenching at selected points, electrical-resistivity surveying if possible, etc.), and the full use of the literary sources which Pallottino's valuable research has digested for us.

The topographical evolution of the necropolis, which was spread over five centuries or so, witnessed a gradual swinging of the main weight from the East to the West end of the Monterozzi. It was not an orderly process; the same precious ground was filled and refilled to its maximum capacity. The area shown on PLATE II is known to have been much favoured for tumuli in the VII–V centuries. It is probable that numbers of the smaller soil-marks are *tumuletti arcaici* of the type already seen at Caere. Two probable *vie sepolcrali* can also be added; e.g. a tumulus alignment for about 110 yards

¹⁸ Approximate diameters, in feet, of soil-marks for six specimen ploughed-out tumuli indicated on PLATE 2 (1) 50, (2) 30, (3) 60, (4) 50, (5) 60, (6) 25.

¹⁹ Pallottino stated that about 100 tumuli are visible between Primi and Secondi Archi. Westphal in 1830 said that some 600 of their gibbous profiles were recognizable on the Monterozzi.

ETRURIA FROM THE AIR

at A, with another nearly parallel ; and an alignment of tumuli for 140 yards at B. These are conservative figures. Prof. Pallottino suggested that there was a *via sepolcrale* along, or near, the east edge of the escarpment between Arcatelle and Secondi Archi, and there are several possible alignments in this area on PLATE II, notably at C.

COLLE PANTANO

At a distance of $5\frac{3}{4}$ miles (9.2 km.) due south of Tarquinia aerial-photography has brought to light what appears to be a new necropolis (PLATE III B), which I have named after the nearby hill on whose lowest slopes it lies. Although the site as a whole is small compared with the Banditaccia and Monterozzi, the soil-marks which probably indicate the presence of tumuli are particularly clear.

The reasons for their appearance have already been given, during the description of PLATE II. They are situated on two long, low, rounded spurs between the marshy land (*pantano*) along the river Mignone, and the railway line. Their distribution forms an equilateral triangle of about 750 yards along each side. Prof. Pallottino in his *Etruscologia* states that 'There are many little Etruscan settlements on the trachitic Tolfa Mountains and at their feet meriting exploration' (20).

PLATE IIIB is from a photograph taken on 5 April 1944 and has a scale of 1:9600. At least 38 large soil-marks can be identified and some of them form a composite cluster of two or three smaller ones, so that it is thought that about 50 independant structures may be represented. A detailed description of each, with measurements, would be out of place here. The resemblance to ploughed-out tumuli, like those at Monterozzi, is very striking, but I have not yet been able to visit the site on foot to confirm it. The form and size of the soil-marks are just what one would expect, and this interpretation seems to me to be extremely probable. A few of the most interesting ones have been singled out for special comment. The stony spread that forms the soil-mark makes it difficult to see the exact shape of the structures but some are clearly sub-rectangular, for instance No. 9 (80×60 feet approx.) and No. 32 (125-150×75-95 feet approx.) which shows an obvious right-angle. The soil-marks are sometimes composed of three units, e.g. No. 16 (each of them 65 feet across) and No. 37 (of similar size). These measurements somewhat exaggerate the real size of the structures, but evidently they are not little *tumuletti arcaici* which give much smaller soil-marks. The sub-rectangular ones might perhaps be forms of quadrangular *tombe a camera* of the kind illustrated on p. 43 of Pallottino's booklet. However, a fuller interpretation of this new site must await inspection on the ground.

²⁰ About 900 yards SE of the Colle Pantano site are a few possible circular soil-marks near Casa dell' Uomo Morto (Dead Man's House).

Whales as an Economic Factor in Prehistoric Europe

by GRAHAME CLARK

ARCHAEOLOGISTS have long been aware that whales were extensively utilized by dwellers on the Atlantic sea-board of prehistoric Europe (1). The frequent discovery of cetacean bones in ancient middens and, in regions such as the extreme north of Scotland and the Orkneys, of implements and other objects fabricated from them prompts one to inquire into the source of the whales. Were some of them hunted, or did prehistoric man confine himself to stranded specimens? Again, it is interesting to speculate on the various ways in which whales, whether hunted or stranded, contributed to the economy of early man.

Most authorities have assumed that stranded whales provided at any rate the main source of supply and some have doubted whether whale-hunting entered the picture at all in early times. Professor V. G. Childe (1931, 97) remarked of the Neolithic settlement at Skara Brae in Orkney that whalebones 'turned up in considerable quantities, but the amount found hardly presupposes an organised whaling industry. One or two stranded whales would provide all the material actually unearthed', and in a later work the same author (1935, 248) leaves it to be inferred that the whale bones used by the broch-builders of northern Scotland were derived from the skeletons of stranded whales. Again, referring to cetacean bones from Danish kitchen-midden sites of the Ertebølle culture, Dr V. Nordmann (1936, 127-8) expressed doubts whether the boats available at the close of Mesolithic times were adequate for hunting whales and preferred to attribute the finds to stranded specimens. On the other hand, Dr Therkel Mathiassen, whose experience of Eskimo whale-hunting gives his opinion in this matter peculiar weight, had in the previous year (1935, 150) suggested that whales were hunted by the Ertebølle people. No one can doubt that stranded whales were an important source of supply in prehistoric, as in much later historical times, and conclusive evidence for this will be cited at a later stage in this article. The question at issue is how far, if at all, whales were hunted in prehistoric Europe.

Before the discussion can usefully proceed, it needs to be emphasized that many different species of the Order *Cetacea* are found in European waters and that these vary greatly in size, habits, distribution and ease of capture. It is essential, if any valid conclusions are to be reached, that the characteristics of the species illustrated by fig. 1 should be distinguished (2), especially in so far as these influence their mode of capture.

¹ Several species of whale penetrate the Mediterranean and some are at home there, but there is no indication that whales were economically important in ancient any more than in modern times. Dolphins are particularly numerous and were commonly depicted by the Minoans, as in the well-known fresco in the 'Queen's Magaron' at Knossos; although the barbarians of the Black Sea used their fat for oil and ate their flesh salted, the Greeks and Romans regarded Dolphins auspiciously as guardians of mariners and refrained from slaying them, except for medicinal purposes (Keller, 1909, 408-10).

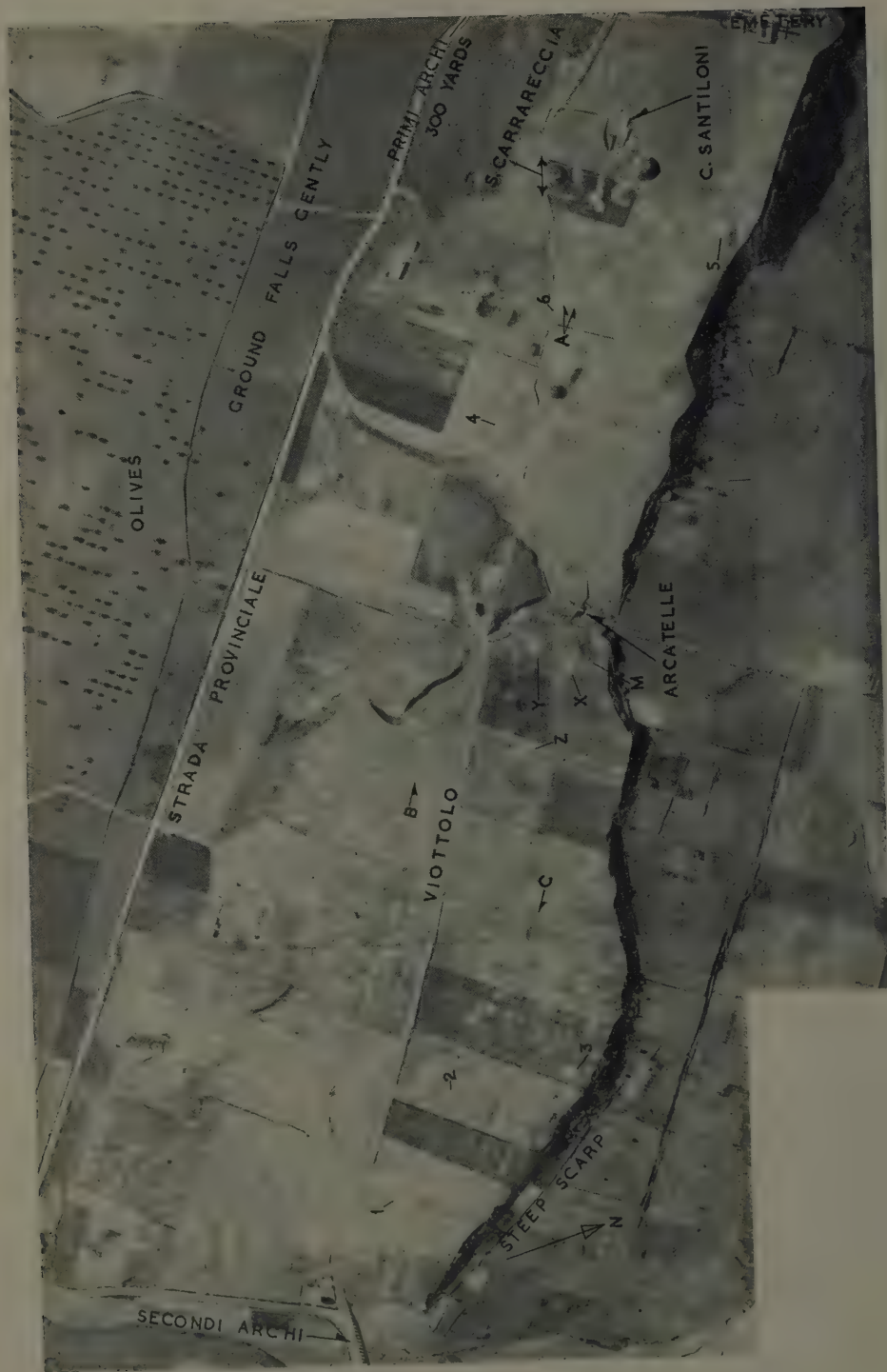
² On the advice of Dr F. C. Fraser of the British Museum (Nat. Hist.), to whom I am greatly indebted for reading this paper in typescript and for help in other ways, I have followed Hentschel's system of 1937. Latin names, with the English equivalents used in the text, are shown in the underline to fig. 1.

PLATE I



CAERE: BANDITACCIA NECROPOLIS, SCALE 1:8500 (see p. 78-80)

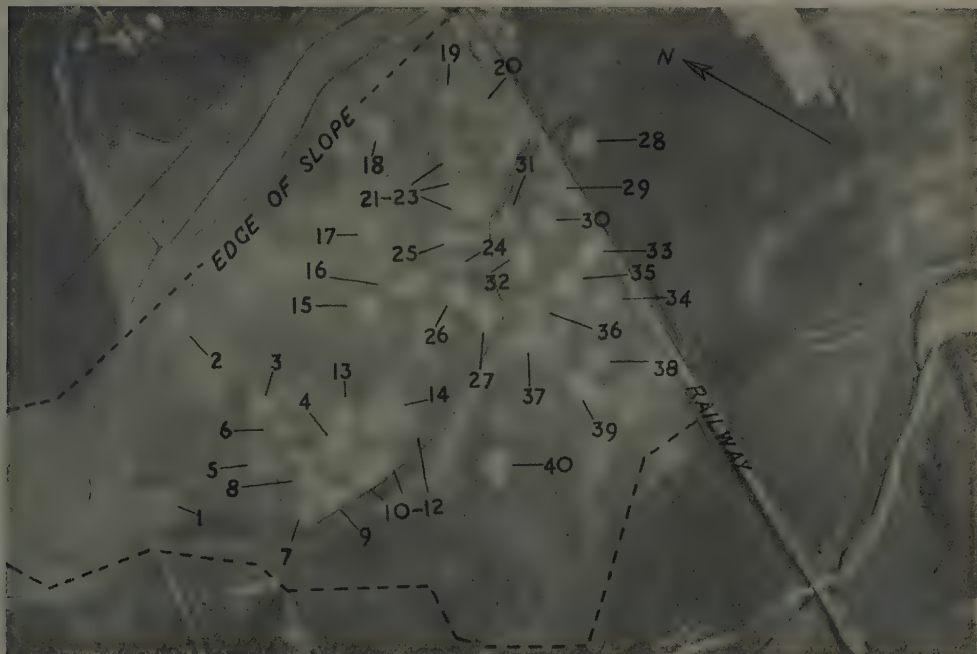
Tumuli revealed by crop- and grass-marks



TARQUINIA : MONTEROZZI NECROPOLIS, SCALE 1 : 7500 APPROX. (see p. 80-3)
Tumuli revealed by soil-marks



A. CAERE: DETAIL OF PLATE I, TO SHOW SOME OF THE TUMULI AND VIE SEPOLCRALE DISCLOSED BY AIR PHOTOGRAPHY, SCALE 1:3800 APPROX.



B. COLLE PANTANO: PROBABLE NECROPOLIS, SCALE 1:9600 (see p. 83)
Tumuli revealed by soil-marks

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

At the same time it will be convenient to review some of the main facts about the development of the several whale fisheries of historical times, since in this way it is possible to limit the number of species which could have been pursued under prehistoric conditions.

One may begin with the Baleen Whales, distinguished from the Toothed Whales by the horny plates of whalebone or baleen, which hang from their upper jaws and serve to retain the small organisms upon which they feed. Of the two families of Baleen Whales in our area, the first to be considered will be the Right Whales, from which

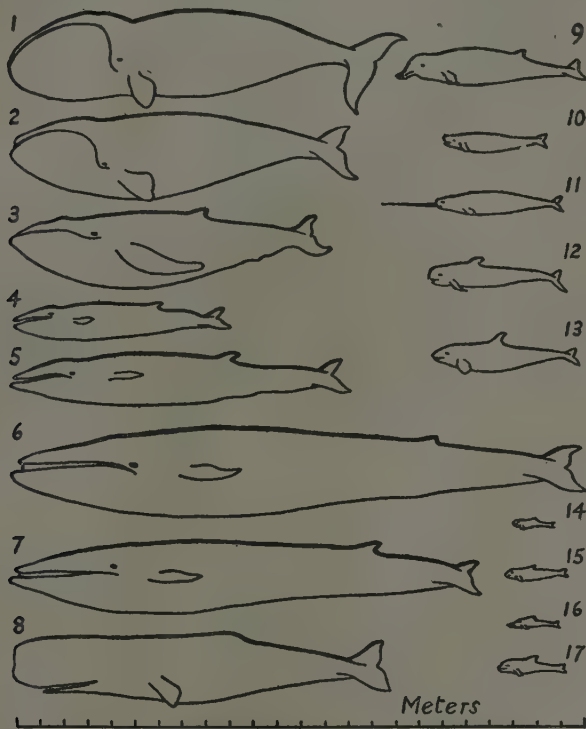


FIG. 1. WHALES COMMONLY FOUND IN EUROPEAN WATERS

For Key, see FIG. 8.

after Hentschel, 1937

the Rorquals are marked off by the furrows on the lower jaw and throat and by the fin on the rear part of the back. Of the two Right Whales, the Greenland species can be eliminated as the object of hunting in prehistoric Europe, since the fishery did not begin until whalers began to penetrate effectively the region of pack-ice in which it is at home, early in the 17th century. According to Norman and Fraser (1937, 209-11), the fishery began in the Spitzbergen, Jan Mayen and East Greenland area in 1611, spread to Baffin's Bay in 1719 as the original waters became depleted, and ended up, from 1843 until about 1900, in the Behring Strait and the Okhotsk Sea. The Greenland Whale, which formed the back-bone of the industry during the 17th and 18th centuries, is now one of the rarest in the seas.

The Biscay or Atlantic Right Whale, on the other hand, was certainly hunted as far back as the Dark Ages. The fishery was strongly developed by the Basques, who attacked the females as they penetrated the bays of Gascony to bring forth their young during the winter. According to Fischer (1881), to whose monograph the reader is referred for details, the fishery was at its height during the 12th and 13th centuries, on the decline in the 17th and almost extinct in the 18th. When it began remains obscure, although it would appear from Fischer's account to have been active already by the 10th century (3). Traces of the look-out towers used by the Basques to spot whales and of the furnaces, in which, after harpooning and dismembering ashore, their fat was melted, can still be seen at several points on the coast (Fischer, 1881, 24). When the inshore whale-fishery declined, the Basques went further afield and, according to Schreiner (1927, 303), had already established fisheries off Ireland, Iceland and Norway by the 15th and 16th centuries.

There is, however, some evidence that the Biscay or Atlantic Whale was hunted on the Norwegian coast long previous to this. In the course of his report to King Alfred on the resources of his native Helgeland, Ohthere described how with five companions he had in the course of two days slain 60 whales, each 48 ells long, the largest 50 (Ross, 1940, 21). What these lengths signify in our measurements is uncertain: Schreiner (1927, 302) is inclined to equate an ell with a foot, but Ohthere speaks of walruses, the males of which reach some 14 feet in length, as being not longer than 7 ells. In any case the whales hunted off the coast of Helgeland were certainly large enough to make Ohthere's bag on the tall side. For reasons which will become apparent, there is no question of Ohthere's whales being identified with the larger Rorquals. Equally, as Schreiner noted, the Greenland Whale must be ruled out as a species habitually hunted on the Norwegian coast, since it keeps close to the ice-margin. It seems that Ohthere can hardly have been referring to any other than Biscay Right Whales. Archaeological support for this comes from a stone slab grave at Hundholm, Tysfjord, in Helgeland, which yielded, in addition to iron weapons dating from the 8th and 9th centuries, an unworked hyoid bone of a large whale, interpreted by Schreiner as a hunter's trophy and identified tentatively as belonging to a Biscay Right Whale.

Arguing back from historical times, the question whether the Biscay Right Whale was hunted in prehistoric times must remain open. It should be remembered also, that although large, the Right Whales are comparatively docile and can be taken with quite simple tackle. Murdock (1892, 275) has described how the Eskimo of Point Barrow used to hunt the Greenland Whale from *umiaks*, skin-covered boats of a type current in Europe certainly as early as the Late Stone Age (Clark, 1946, 37). The Eskimo would paddle up to the whale and strike it with a heavy harpoon-head mounted on a detachable shaft and secured to floats. Every time the whale came up to breathe it would be struck again, a fresh harpoon head having in the meantime been mounted in the original shaft and many other *umiaks* and their crews having joined in the fray. Finally when sufficiently wearied, it would be despatched by a heavy lance mounted with a flint head (Murdock, 1892, 240-1).

As a family the Rorquals or Finwhales were mostly neglected by early whalers on account of their speed and lack of buoyancy, combined with their large size (Norman and Fraser, 1937, 236). Scoresby's observation that a harpooned Rorqual ran out 480 fathoms, or more than half a mile of line, in approximately a minute, gives some idea of their power. Serious pursuit of most species had to wait until the perfection

³ T. Southwell (1881, 50) maintained that the fishery was established 'as far back as the 8th or 10th century'.

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

of the harpoon gun in 1865 by Herr Svend Foyn, whose station at Vadsö in Finnmark was the first base for the new fishery. The only exceptions were the Humpback Whale, which when inshore could be hunted by common hand harpoons and lances, but which had the grave disadvantage of sinking, necessitating a wait until decomposition had generated enough gas to float the corpse to the surface, and the Lesser Finwhale, which was only a third the size of the Blue Whale and even so could only be taken under very special local conditions, such as obtained in two bays in the immediate area of Bergen. According to Eschricht's account (1849, 16-7) of the hunting during the 18th and early 19th centuries, a watch was kept at the season when the whales were accustomed to penetrate these bays and wide-meshed nets made from bast were kept in readiness to cut off their retreat. Any disposition to charge the net, which was of course incapable of holding a whale and was intended rather to terrify, was checked by beating the water with wooden mallets and so by setting up a commotion heading the creature back into the inlet. Once securely within, the whale was met with a hail of arrows fired from cross-bows, each marked with the owner's name to secure a share of the quarry. Only when the whale, after many attacks, was seen to be near its end, did the boats approach close enough for the harpoons to be hurled in—and even then it was left to tire awhile before being towed to shore by a fleet of small boats. From first to last the struggle sometimes lasted as many as nine days and nights, which only goes to emphasize the toughness even of the smaller Rorquals: as a family and under normal circumstances these must be considered to have been beyond the range of the prehistoric hunter.

Of the three families of toothed whales commonly found in European waters, only the true Dolphins were the object of well established fisheries during early historical times. The hunting of the Sperm Whale, a dangerous customer, up to 20 metres in length, but capable of jumping clear and of destroying boats, is said to have begun off New England about 1712. The other member of the family *Physeteridae*, the Bottle-nosed Whale or Dogling, was comparatively easy to catch, but the 'Dogling-field', where they concentrate between mid-April and the end of June, is remotely situated north of the Faroes and Shetlands and south of Jan-Mayen; moreover, as Debes commented in 1676 (181), with reference to individuals caught in the Faroes, 'the flesh and fat of these Doglings are not good to eat'.

Neither species of the *Delphinapteridae* family can have played a significant part in prehistoric hunting. The White Whale, like the Greenland Right Whale, is an arctic species, which, though formerly much hunted in the Spitzbergen area by Norwegians and Russians, and though still taken by nets in the White Sea, only rarely occurs further south; for instance schools of White Whales appeared in Christiania Fjord in the spring of 1903, following a very severe winter, during which they were hunted in the Bergen area. The Narwhal, the long tooth of which so fascinated medieval people, is equally arctic in habit, only rarely penetrating temperate waters.

By contrast with many of the whales so far discussed, several of the eight species included under the family *Delphinidae* are known to have been hunted in Europe during historical times and none can be deemed to have been beyond the powers of prehistoric man. The Pilot or Caa'ing Whale, which centres on the Faroes, where it is still taken (Annandale, 1905, 44), used once to be hunted also in the Orkney and Shetland Islands (Harmer, 1927, 36-7) and in the Hebrides (Martin, 1934 ed., 88). From the many surviving accounts, ranging from Debes (1676) up till modern times, it is evident that an extremely primitive method was used: the whales were headed off from the open sea by boats, herded into a chosen inlet and actually driven ashore, a proceeding made possible by the way this species instinctively follows its leader in a blind rush. In this

way hundreds of Pilot Whales might be killed in a single day and it has been recorded that no fewer than 16,299 were so taken in the Faroes between 1835-44 (Eschricht, 1849, 16-7).

The Dolphin most abundant in European waters is the Common Porpoise, which habitually moves in small shoals near the coast and penetrates fjords and river estuaries, sometimes venturing considerable distances upstream (4). As might be expected, records of the catching of Porpoises during the historical period are very numerous. For the most part these relate to the accidental entanglement of Porpoises in fishermen's nets, but there are nevertheless indications that specialized Porpoise fisheries existed in some parts of Europe. Although no regular fishery existed on the Atlantic seaboard of France, there is evidence that one was carried on on the coast of Normandy between the estuaries of the Couesnon and the Bresle and that this was already active by the 10th century and remained so into the 14th (Fischer, 1881, 175). Two fisheries were carried on in Danish waters. One of these was devoted to the Porpoises, which appear in the Isefjord, Zealand, often in shoals of over a hundred, towards the end of March at the time of the Spring Herring and remain until the trees turn green; centred mainly on Jaegerspriis, and carried on by means of nets, this fishery used to yield up to between 300 and 400 Porpoises a year. A more prolific fishery was carried on from Middlefart, Fyen. This was aimed at the Porpoises which assemble in great shoals to pass through the Little Belt on their way out of the Baltic, a movement beginning in November and substantially complete by Christmas. Up till about 1880 the fishery was controlled between St. Martin's Day (Nov. 11th) and Candlemas (Feb. 2nd) by a guild of Porpoise hunters, which still mustered ten boats of three as late as 1849 and in 1593 had numbered thirty-six members. The hunt was conducted by beating the water so as to head the shoals into bays across which nets had been stretched in preparation; over a thousand Porpoises were often dragged ashore in this way in the course of a year (Eschricht, 1849, 15-6; Japha, 1909, 119).

There is less information about the pursuit of other species of Dolphin in European waters, but mention should be made of the hunting well into the 19th century of the great shoals of White-sided Dolphins and Killer Whales, which used occasionally to penetrate certain bays in the immediate area of Bergen. One of the largest catches, that made on Dec. 31st, 1834, accounted for some 700 (Eschricht, 1849, 16-7).

A review of what is known about the hunting of the main species of whale in European waters during historical times has shown that several can be ruled out as possible quarries of prehistoric man; in this category must be numbered most of the large kinds, including the Greenland Right Whale, the various members of the Rorqual family and the Sperm Whales. Others, again, such as the Narwhal, the Bottle-nosed Whale and the White Whale, can have played only a very restricted and minor part during Post-glacial times in Europe. On the other hand, it has been shown that Biscay Right Whales, Porpoises, Pilot Whales and other Dolphins have been hunted during historical times by quite primitive methods.

Before turning to interpret the evidence from prehistoric times a word must be said about an alternative source of supply, namely whales stranded in the ordinary course of nature without human intervention, which might on *a priori* grounds be considered the more primitive. Owing to the importance attached by modern zoologists to exact

⁴ Porpoises were observed in the Thames at Teddington in the winter of 1917-8 and one was actually stranded at Venlo, on the Maas, more than 200 miles from the sea (Harmer, 1927, 20-1). According to Fischer (1881, 171), they penetrate 40 km. up the Charente and pass up the estuary of the Garonne as far as Bordeaux.

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

records of strandings, there is plenty of evidence available for recent times. Records have been maintained for the British Isles as a whole since 1913, when the scheme for reporting stranded whales to the British Museum became effective. Within certain limits such records form a useful guide to the numbers of stranded whales available to early man. A number of the specimens noted in the reports have been wounded or disabled by modern whaling or fishing activities and might be held to inflate the totals, but against this must be off-set the fact that the records are very unlikely to be complete, especially for the smaller species and for unfrequented stretches of coast. Analysis of the 407 strandings (5) recorded on the coasts of Britain between 1913-26 (Harmer, 1927)



FIG. 2. MAP SHOWING DISTRIBUTION OF RORQUALS STRANDED ON THE SHORES OF BRITAIN BETWEEN 1913 AND 1926

shows that, although as many as 178 relate to the Common Porpoise, no less than 14 out of the 19 species listed by Hentschel are represented as well as three rarer species (6). Of special relevance is the fact that over the same period an average of exactly four Rorquals were stranded yearly; although well distributed, it is worth noting (fig. 2) a local concentration in the extreme north in Caithness and Orkney. On the much shorter coast of Holland, it may be noted that a dozen Rorquals were recorded between 1903 and 1916 (van Deinse, 1918, 192-3). In a striking study of occurrences of whales in the Baltic during historical times, it has been shown by Japha (1909) that since 1800 no less than 15 of Hentschel's 19 species were represented out of a total of 55 strandings (other than of Porpoises); among these were no less than 17 Rorquals.

⁵ Strandings of more than one individual of the same species are counted as one, if occurring on the same day at the same locality.

⁶ viz. *Mesoplodon bidens*, *M. mirus* and *Ziphius cavirostris*.

That strandings of whales should so often have been recorded in past centuries only reflects their economic value and it is significant that such records are mainly concerned with ownership. Rights were often meticulously defined: in a charter dated 18 April 1148, granted by Pope Eugenius III to Hilary, Bishop of Chichester, confirming the property of the church, it was made clear that the bishop was entitled to 'any whale found on the land of the church of Chichester, except the tongue, which is the King's', but that in the case of one found elsewhere in the diocese his rights extended to 'the right flipper only' (Peckham, 1946). When, as must often have happened, the vulgar fell upon the carcase of a lord's whale, the machinery of the law was invoked to secure redress and this gave rise to more documentary evidence. Thus, on 15 January 1281 there was issued a Commission of oyer and terminer touching persons who cut off and carried away part of a whale cast ashore at Thornham and Titchwell, being the wreck of Isabella de Albini, Countess of Arundel (le Strange, 1916, 191). It is worth noting that in the first half of the 14th century stranded whales were commonly assessed at £100, as was the case with two washed ashore on the Lincolnshire manors of Friskney and Sutton, belonging to Alice, Countess of Lincoln, and carried away by certain men, pertaining to whom Commissions were appointed in February, 1340 (*ibid.*, 284). Commenting on the magnitude of this customary fine, le Strange remarked that it was 'difficult to believe that any whale could have been worth a sum equivalent to £1000 to £1200 of our money today' (*op. cit.*, 280). While doubtless designed to act as a deterrent, such a sum may not have been wholly fantastic in the circumstances of the day, when whales were comprehensively utilized and farming was still at a low stage of productivity. In his great *Historia de gentibus septentrionalibus*, published at Rome in 1555, Olaus Magnus maintained that the proceeds of a single whale might fill between 250 and 300 waggons and yield meat for salting, blubber for lighting and heating, small bones for fuel, large ones for house-building and hide sufficient to clothe 40 men (Book 21, cap. 20 and 24).

Before property rights were so well defined, the stranding of a whale, representing as it did in its carcase not merely wealth, but a period of well-being for an entire community, must have been a frequent cause of conflict between rival claimants. In the Icelandic Saga of Grettir the Strong (7) the story is told of how the news of the stranding of a large Rorqual at Rífsker spread afield and of how 'all the famous who could get away went to the whale'. 'The first to arrive were Flosi and the men of Vík, who at once began to cut up the whale, carrying on shore the flesh as it was cut. Then there came the men of Kaldbak with four ships'. On their leader, Thorgrim, laying claim to the whale, Flosi straightway challenged him and Thorgrim saw he was outnumbered. But 'then there came a ship across the fjords, the men rowing with all their might. They came up; it was Svan of Hol from Bjarnafjord with his men, and he at once told Thorgrim not to let himself be robbed'. Then the struggle began and the men of Vík fared ill, until help came with the appearance of Olaf with ships from Drangar, whose arrival turned the tables and enabled Flosi to win the day. A verse was composed on these doings:

'Hard were the blows which were dealt at Rífsker;
no weapons they had but steaks of the whale.
They belaboured each other with rotten blubber,
Unseemly methinks is such warfare for men'.

⁷ Grettir was born in 996 and died in approximately 1031. The Saga was written down in the 13th century, but its surviving version dates only from the 15th. Quotations are made from the Everyman Edition.

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

The records from historical times are sufficiently numerous and widespread to suggest that strandings must have occurred in substantial numbers on the Atlantic coasts of Europe during prehistoric times. There is plenty of evidence that this was indeed so. In the days when the Wash extended further into the Fenland than it does today numerous whales were stranded and their skeletons incorporated in the Post-glacial silts; among the species identified from skeletal remains may be included the Greenland Right Whale, the Killer Whale, the Bottle-nosed Dolphin and the Porpoise (Skertchly, 1877, 120; Miller and Skertchley, 1878, 342). Further north, the Firth of Forth must have been a veritable deathtrap to whales at the time of the deposition of the carse clays, when it extended some twelve miles west of Stirling. Even in modern times whales are stranded in the Firth, as witnessed by the three recorded by Sir Robert Sibbald between 1689-92 and by the Blue Whale stranded at Longniddry in 1869 (Turner, 1912, 11 and 40): when able to swim many miles further up the estuary, as they could during the period of the Litorina submergence, whales ran a commensurately greater risk of being caught by the falling tide. Evidence that many whales suffered this fate is given by the number of their skeletons found during the last 130 years around the former shores of the Firth (fig. 3), information about which was assiduously collected by Sir William Turner (1889 and 1912) and others. Although only a few of the whales have been accurately identified as to species, it has been shown that the Rorquals, including the great Blue Whale, were strongly represented, creatures which, since they can hardly have been hunted by early man, must be regarded as having been stranded. It is of outstanding interest that despite the casual conditions under which many of the early discoveries were made, traces of the implements used for removing the blubber and flesh were found in no less than four instances, viz.:

Airthrey: the skeleton of a whale, estimated at 72 ft. in length and identified by Sir Wm. Turner as that of a Blue Whale, was found in 1819 close to the east gate of approach to Airthrey Castle.

‘Two pieces of stag’s horn . . . , through one of which a hole of about an inch in diameter appears to have been bored’ were recovered from close by the skeleton (Turner, 1889, 790; 1912, 5-6).

Burnbank, Blair-Drummond: the skeleton of a large whale, brought to light under four feet of coarse clay when digging a ditch in 1824, was accompanied by a piece of perforated deer’s antler with traces of a wooden handle (Turner, 1889, 790).

Meiklewood: during draining operations in 1877 on Woodyett farm on the Meiklewood estate, the skeleton of a Rorqual came to light: ‘resting upon the front of the skull and lying vertically in the blue silt, was an implement made of the horn of a red-deer A piece of wood, 1 $\frac{3}{4}$ inches long, occupied the hole in the antler’ (Turner, *op. cit.*, 790-1).

Causewayhead: several portions of the skeleton of a whale were revealed during the cutting of a drain from the village towards the river Forth in 1897. One end of a rib of the whale is said to have shown traces of human work and ‘a short distance from the ribs a part of the beam, with one of the tines, of the antler of a red deer was found’ (Munro, 1898, 291-2; Turner, 1912, 110).

Discussing the earlier notion that the antler objects found with the whales were ‘harpoons’, Turner interpreted them quite rightly as implements designed to despoil ‘the carcase of its load of flesh and blubber’ (1889, 791). The head of the axe (fig. 4) found with part of its wooden handle against the skull of the Meiklewood Rorqual might well have served this purpose. A comparable discovery may be cited from the peninsula

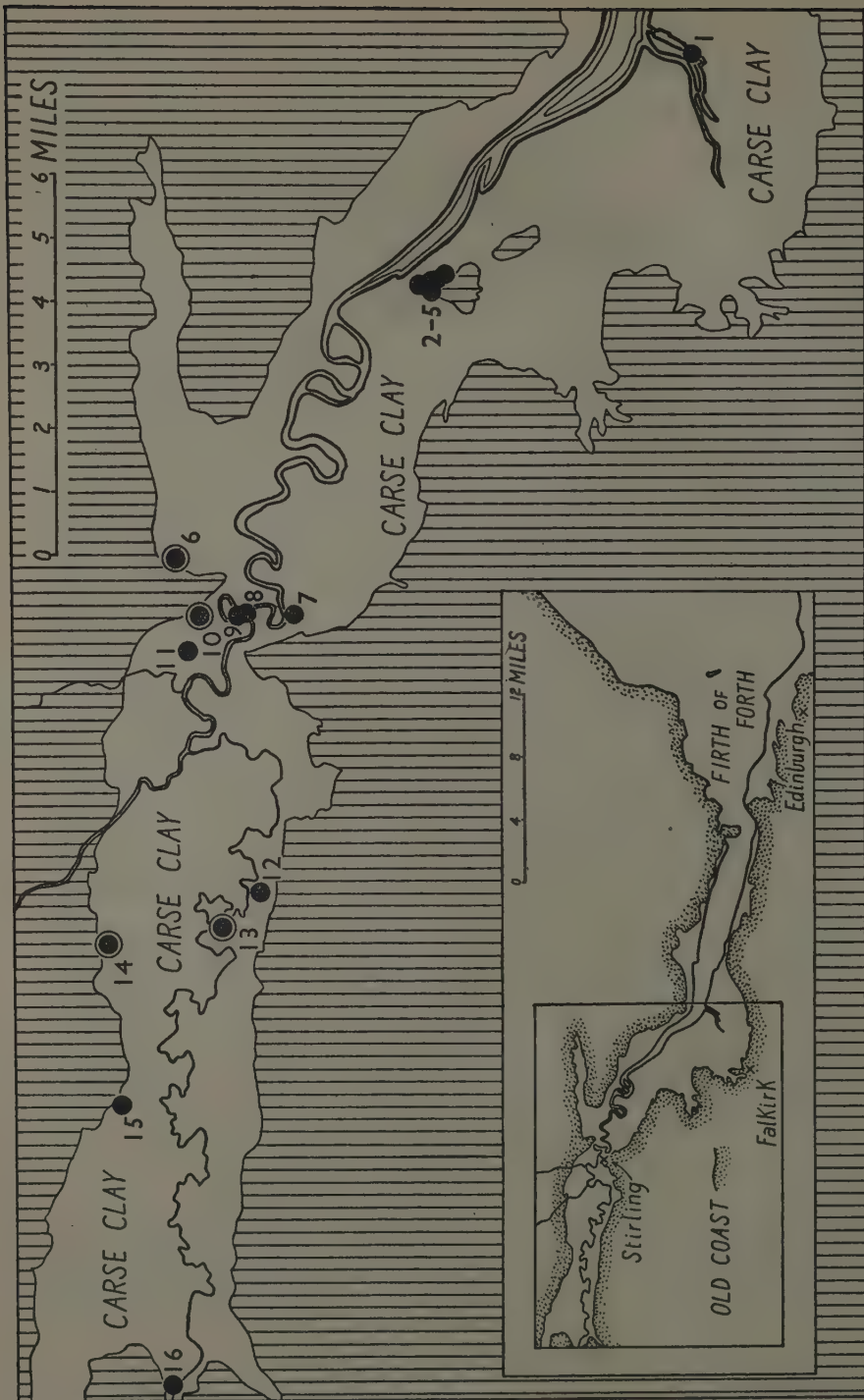


FIG. 3. DISTRIBUTION OF REMAINS OF WHALES STRANDED ON THE SHORES OF THE FIRTH OF FORTH DURING THE STONE AGE
 NOS. 6, 10, 13 AND 14 WERE ACCOMPANIED BY IMPLEMENTS OF DEER ANTLER

no. 1 Grangemouth ; nos. 2-5 Dunmore ; no. 6 Airthrey ; no. 7 Forthbank ; nos. 8-9 Cow Park, Stirling ; no. 10 Causewayhead ;
 no. 11 Cornton ; no. 12 West Carse ; no. 13 Meiklewood ; no. 14 Blair Drummond ; no. 15 Ballinton ; no. 16 Cardross

(Based on Turner, Munro and Morris)

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

of Helgenaes, East Jutland, where in an old beach deposit of the Litorina Sea, revealed in the drained Vaengesö, the skull of a Common Rorqual was found in 1920; in the course of its removal by an assistant of the Danish Geological Survey there came to light eight flake axes, two stump-butted stone axes and three flint flakes, the equipment used by Stone Age man to despoil the carcase (V. Nordmann, 1936, 127-8). Here, indeed, from the Stone Age shores of the Firth of Forth and of Eastern Jutland we are confronted by the prehistoric equivalent of the iron tools depicted by Olaus Magnus at work on a 90-foot Rorqual stranded near Tynemouth in August, 1532 (fig. 5).



FIG. 4



FIG. 5

Turning now to the whale-bones from the prehistoric dwelling-places mapped on fig. 6 and listed in Appendix I, we must face a difficulty which pervades all attempts at interpreting the evidence furnished by prehistoric archaeology, namely the unequal standards of research prevailing in different parts of Europe. As previously emphasized, it is vital to the present discussion to take full account of the several varieties of whale represented; yet, outside the Scandinavian countries and Holland, only a few of the cetacean bones from archaeological sites have been classified as to species. Thus, as regards the material from the Mesolithic midden at Tévéc off the coast of Morbihan we are merely apprised of the presence of remains of a large variety of whale and of a small species of toothed whale. Again, very few of the cetacean bones from archaeological (as distinct from geological) sites in the British Isles have been identified (8): we know

⁸ In the case of Scottish finds, it must be remembered that many of the surviving whale-bones, especially in the far North, have been, artificially shaped, which would often preclude accurate zoological determinations.



FIG. 6

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

that Porpoises were represented at Kent's Cavern and Kintradwell, Sperm Whale at Hoxay and Killer Whale at Keiss and Kintradwell, but it is tantalizing, for instance, to read of the rich material from Skara Brae featuring such items as the jaw-bones of a 'large whale' or the head of a 'small whale'. One can only say that, except in so far as they represent Right Whales, remains of large ones like the 'fragments of limb bones and vertebrae of a very large whale' from a midden near Gullane or the Rorqual bones from Caisteal-nan-Gilleann, are likely to derive from stranded specimens of species beyond the reach of prehistoric hunters. On the other hand, it would be interesting to know, for example, whether the bones of the Pilot Whale are represented on prehistoric

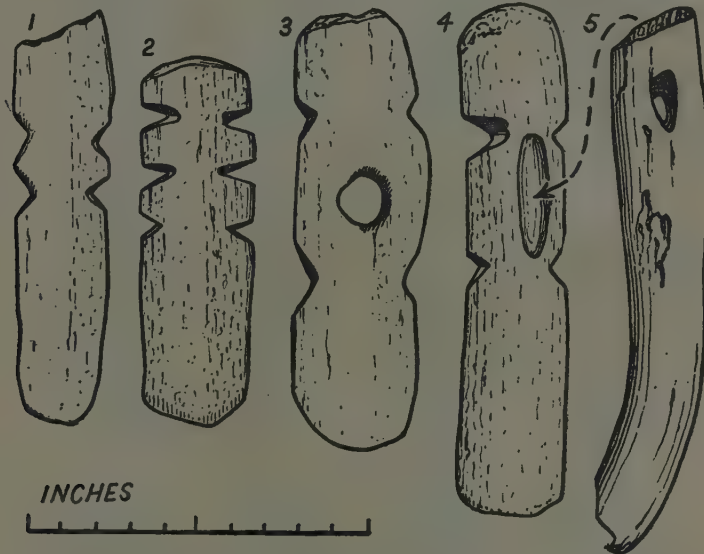


FIG. 7. ESKIMO BLUBBER MATTOCK BLADES (NOS. 1-4) AND HANDLE (NO. 5)
MADE FROM WHALE RIBS AND WOOD

nos. 1-2 from Baffin Land and Hudson Bay area (Boas, 1907, fig. 214)

nos. 3-5 from the Naujan find, Repulse Bay, N. Canada (Mathiassen, 1927, pl. xxi)

sites in regions where a primitive form of hunting survived until modern times; concentrations of finds in such an area might suggest a prehistoric origin. Again, one would like to know to what extent the smaller Dolphins were represented on the Scottish sites. Meanwhile, it can safely be said that stranded whales must have been an important element in the economy of Orkney, Caithness, parts of the east coast and the Hebrides throughout prehistoric times, and it is worth pointing out that since the larger stranded whales were despoiled as they lay on the shore, being too heavy to move, their bones would as a rule only occur on sites if brought there for use (9); whale-meat and blubber may, for instance, have played a much greater part in the diet of the Skara Brae people than even the fairly numerous bones imply.

In this last connexion one may refer to the adzes (and a couple of axes) made from

⁹ The geographical distribution of objects, made from cetacean bone in Scotland suggests that the material was not at this time widely traded; for instance all the finds are within some four miles of the coast.

ANTIQUITY

the distal ends of ox metapodials, which have been described (Childe, 1931, 124) as 'quite the most distinctive tool manufactured' at Skara Brae, some 25 examples having been found there during the excavations of 1927-30. Puzzled to account for these, Professor Childe asked 'what was there to hack with an adze on a treeless island'? One can only suggest that they were used for detaching slabs of blubber from stranded

NOTE The various species are numbered with reference to FIG. 1						Danish sites	Swedish sites*	Norwegian sites	Total from sites	Representations on rock-engravings
<i>Balaenidae</i> (Right Whales)	..	1.	Greenland	..	..	1	—	—	1	—
		2.	Biscay	..	..	—	—	—	—	—
<i>Balaenopteridae</i> (Rorquals)	..	3.	Humpback	..	..	—	—	—	—	—
		5.	Sei-whale	..	..	—	—	—	—	—
		4.	Lesser Finwhale	..	..	—	—	—	—	—
		6.	Blue Whale	..	..	1	—	—	1	—
		7.	Common Rorqual	..	..	—	—	—	—	—
Total Baleen Whales	..	..	..	..	..	2	—	—	2	—
<i>Physeteridae</i>	..	..	8.	Sperm Whale	..	1	—	—	1	—
		9.	Bottle-nosed Whale	..	..	—	—	—	—	1 ?
<i>Delphinapteridae</i>	..	..	10.	White Whale	..	1	—	—	1	—
		11.	Narwhale	..	..	—	—	—	—	—
<i>Delphinidae</i> (True Dolphins)	..	..	12.	Pilot Whale	..	—	—	1	1	1
		13.	Killer Whale	..	..	3	1	2	6	3
		14.	Common Porpoise	..	..	10	3	3	16	20
			Risso's Dolphin	..	..	—	—	—	—	—
		15.	White-sided Dolphin	..	..	—	—	1	1	—
			White-beaked Dolphin	..	..	1	2	—	3	—
		16.	Common Dolphin	..	..	1	1	—	2	—
		17.	Bottle-nosed Dolphin	..	..	1	—	—	1	—
			Dolphin <i>sp.</i> ?	..	..	1	—	—	1	4
Total Toothed Whales	..	..	..	..	..	19	7	7	33	29
TOTAL WHALES	..	..	..	..	..	21	7	7	35	29

* In addition, *Mesoplodon bidens* occurred at a West Swedish site.

FIG. 8. TABLE SHOWING THE INCIDENCE OF DIFFERENT SPECIES OF WHALE AMONG REMAINS FROM PREHISTORIC SITES AND AMONG REPRESENTATIONS ON STONE AGE ROCK-ENGRAVINGS OF SCANDINAVIA

whales. The same explanation may be advanced for the large heart-shaped blades of slate or schistose stone, perforated for the insertion of a wooden handle, of which over a hundred were found in the Late Bronze Age level at Jarlshof (Curle, 1933, 100-1). Again, in his report on objects from the wheel-house site at Foshigarra, N. Uist, the late Graham Callander described (1931, 351-2) a series of slabs of cetacean bone,

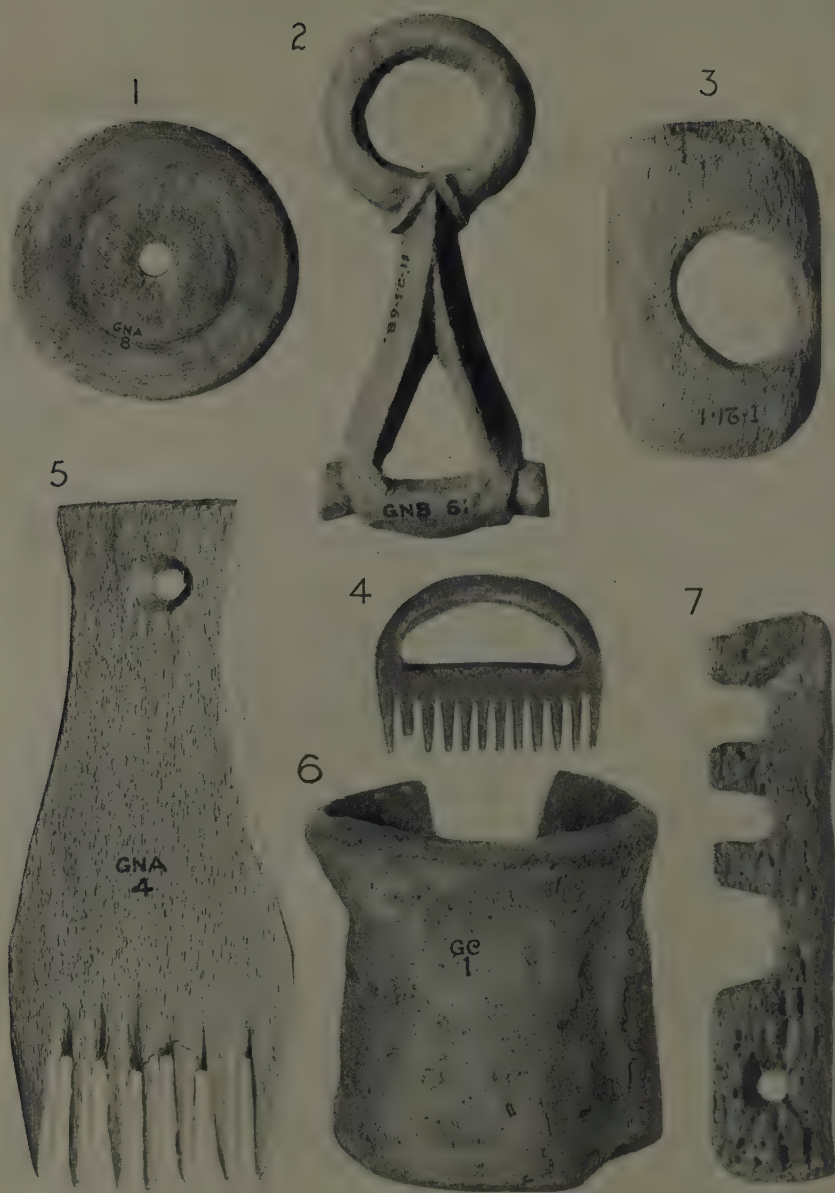
PLATE I



MATTOCK BLADES MADE FROM WHALE RIBS AND PROBABLY USED
FOR DETACHING BLUBBER ($\frac{1}{2}$)

From a wheel-house at Foshigarry, N. Uist.

By courtesy National Museum of Antiquities of Scotland



OBJECTS OF CETACEAN BONE FROM SCOTTISH IRON AGE SITES

nos. 1, 3, 5 Foshigarry, N. Uist; no. 2 Bae Mhic Connain, N. Uist; no. 4 Bowermadden, Caithness;
no. 6 Burray, Orkney; no. 7 Stenabreck, N. Ronaldsay

Scales: no. 6 ($\frac{3}{16}$); no. 1 ($\frac{1}{8}$); no. 3 ($\frac{1}{8}$); no. 5 ($\frac{1}{16}$); nos. 2, 4, 7 ($\frac{1}{4}$)

By courtesy National Museum of Antiquities of Scotland

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

having several pairs of triangular indentations in the sides (PLATE I), a type which he recognized as occurring, sometimes with a perforation, in brochs and wheel-houses in the Orkneys, but for which no very convincing explanation was offered. Yet, precise analogies exist (fig. 7) in the mattock blades of whale rib excavated from the ruins of Eskimo houses in the territory from north-west of Hudson Bay to W. Greenland, where in the frozen soil the wooden handles to which the blades were lashed at right-angles may still survive (no. 5). As regards their function, Dr T. T. Paterson informs me that he has observed similar mattocks used for removing blubber from a large whale driven ashore in the Disco Bay area of W. Greenland as recently as 1937. It is reasonable to suppose that the wheel-house and broch people of northern Scotland and the islands used their heavy whale rib mattocks for a similar purpose.

It is possible to speak with far more assurance about the remains of whales on early sites in Denmark, Norway and Sweden, since in these countries they have almost invariably



FIG. 9. ROCK-ENGRAVING AT STRAND, S. TRONDELAG, NORWAY SHOWING A PILOT-WHALE
Scale of one meter. *after Gjessing*

been identified closely, making possible tabulation of their occurrence (10) species by species for each of the areas (FIG. 8). From this it appears that the types of whale, which we have agreed were beyond the reach of prehistoric hunters, are barely represented: only one of the five species of Rorqual is present, namely the Blue Whale already described as having been stranded on the Litorina shore in East Jutland; and the Sperm Whale is indicated only by a single tooth, doubtless from a stranded specimen. Apart from the Greenland Right Whale, represented by a single tail vertebra, all the rest of the cetacean remains are those of Toothed Whales, 31 out of 33 of which belong to the true Dolphin family, half being Common Porpoises. Too much emphasis should not be laid on the absence of the bones of large whales from dwelling-sites, especially in an area in which small use was made of cetacean bone as a raw material. All the same, the overwhelming predominance of the species of whale known to have been hunted by primitive methods during historical times in Europe is sufficiently striking, and the possibility that they were hunted already during prehistoric times cannot be dismissed. On the other hand, the faunal evidence alone certainly does not prove the case.

There is, however, another source of evidence capable of giving us an insight into the very mentality of the prehistoric hunters, namely the rock-engravings of the Arctic

¹⁰ i.e. the number of different sites at which the species is represented, regardless of the number of individuals involved.

Art Group, reviewed in a previous volume of *ANTIQUITY* (1937, 56-69). In this art we see delineated, together with enigmatic signs, boats and human figures, outlines of the beasts on which the hunter depended for his life, among which, in addition to elk, reindeer, bear, water birds, halibut and seals, are no less than 29 representations of whales (Appendix II): of these there is not one example of the species which we have seen to be beyond the reach of primitive hunters; apart from a possible Bottle-nosed Whale, all are true Dolphins, at least two-thirds being Porpoises, but Killer Whales and a Pilot Whale (FIG. 9) were also included. As if this is not enough, there is a close association between representations of whales and of boats or of quarry, such as seals and halibut, the capture of which likewise implies the use of boats: whales are shown at each of the three sites where skin-covered boats are represented (Rödöy (FIG. 10), Forselv and Evenhus), at both those at which seals are depicted (Rödöy and Valle) and at two (Valle and Skogerveien) where halibut are featured. From all this it seems legitimate to conclude that Porpoises, Killer Whales and Pilot Whales were hunted on the Norwegian coast already during the Stone Age. The fact that the proportions in which the different species are represented in the rock-art agree strikingly with those in which their skeletal remains occur on the Scandinavian sites, further suggests that similar hunting was practised on the coasts of Denmark and West Sweden and Gotland.

The conclusion to which we have arrived, then, is that, while stranded whales certainly played an important part in prehistoric, as in medieval times, particularly in North Scotland and the islands, there is evidence that Porpoises, Pilot Whales, Killer Whales and possibly other species of Dolphin were hunted already during the Stone Age, at any rate in Scandinavia. Yet it needs to be emphasized that, if we may judge from the relatively small numbers of bones from early sites, these were not pursued on a scale comparable with seals, which during their breeding seasons must have been considerably easier to secure (Clark, 1946, 27ff).

One may end by considering in more detail the economic benefits which accrued to prehistoric man from whales, whether hunted or stranded. The flesh and blubber of many kinds of whale were important sources of food, light and warmth. Even at the time of Annandale's description (1905, 37-45) the Pilot Whale provided the people of the Faroes with a useful quota of oil, while the meat, salted in casks or dried in strips, was boiled down as winter-feed for cattle, especially after a poor hay harvest. In the 17th century the flesh was still used as human food: Debes tells how the islanders 'partly melt the fat of the whale to make Train Oil, salting the rest with black salt, to make use of it as of Bacon' and how they 'dry and eat the flesh when it is fresh, the same looking and smelling as Beef; and what they cannot straight consume they cut into long segments and hang it up to dry in the wind, consuming it afterwards in time, as other smoked flesh' (1676, 176-7). Porpoise meat, again, although classified by one mid-17th century writer as 'of very hard digestion, noysome to the stomach, and of a very grosse, excrementall and naughty juyce' (Venner, 1650, 106), was esteemed sufficiently highly in earlier times for the great to exert themselves to ensure supplies. As late as the reign of King James V of Scotland, Porpoise meat was bought for the royal kitchens (*Bannatyne Club*, 1836, p. xi). In Saxon times Porpoises were evidently valued: we find six Porpoises detailed as a payment under a lease entered into between the Abbot and community of Bath and Archbishop Stigand between 1061-5 (Robertson, 1939, doc. cxvii); according to a manorial survey dating from the 11th century Porpoises were reserved to the lord of the manor of Tidenham, Gloucester (*ibid.*, doc. cix); and in 979 Ethelred II is said to have encouraged the export of Porpoises from the Seine fishery to London, by exempting ships carrying them from Rouen from the *tonlieu* (Fischer, 1881,

175, no. 3). The flesh even of some of the larger whales was eaten during historical times in Europe. At the height of the Basque fishery the meat of the Biscay Right Whale was regularly sold in the markets of Bayonne, Biarritz and other towns in the area, and it is worth noting that the tongue was specifically reserved to the Church (*ibid.*, 24-6), as in the Chichester Charter it had been to the King (see p. 90). The presumption that whale-meat was eaten in prehistoric times is all the stronger that the bones of the smaller species are commonly found with other meat-bones in midden-deposits. Only when the problem of bringing cattle satisfactorily through the winter had been solved by the introduction of fodder crops in the 17th and following centuries did whale-meat fade from the normal dietary of European peoples.

In certain instances the skins of whales are used for leather. Boots and shoe-laces can be made from the skin of the White Whale (Norman and Fraser, 1937, 288), and Ohthere numbered ship-ropes made from whale-hide and seal-skin among the tribute customarily paid by the Finns to his people in Helgeland (Bosworth, 1855, 44-5).



FIG. 10. ROCK-ENGRAVING AT RÖDÖY, NORDLAND, NORWAY,
SHOWING A MAN IN A SKIN-BOAT, A SEAL AND A PORPOISE
after Gjessing

Whale bones served many purposes. Baleen itself, which among the Eskimo is employed for a multitude of purposes, was used in ancient Ireland for making saddle-trees, sieve-bottoms and, when suitable wood was lacking, hoops for small vessels (Joyce, 1903, II, 288). Particularly in such areas as the extreme north of Scotland and the Islands, whale bones afforded a useful raw material for implements. At Skara Brae the caudal vertebrae of small whales were hollowed out to contain pigments and more capacious basins were made from the vertebrae of large ones (Childe, 1931, 136). Similar vessels were used by the wheel-house and broch builders of Orkney, Shetland, Caithness and the Hebrides, as well as by Late Bronze or Early Iron Age people at Kingston Bucis, Sussex. As we have already shown, portions of rib were shaped to form the blades of blubber mattocks. In addition, cetacean bone was used in Northern Scotland and the islands during the Iron Age for fabricating a variety of objects, commonly made further south of the bones of domesticated animals or of metal, as for instance weaving-combs, perforated mallet-heads, knife-handles and copies of metal hair-combs, keys, harness-pieces and the like (PLATE II). Elsewhere in prehistoric Europe whale bones were used much more rarely, but a harpoon head made from this material was found at the Ertebölle site of Gudsö Vig, Jutland.

Locally, also, whale bone played an important part in house-construction, as it did in the old Thule culture (Mathiassen, 1927, 132-55), and as, according to Olaus Magnus (see p. 90), it still did in northern Europe up to the 16th century. The archaeological evidence, indeed, extends as far back as Neolithic times. At Skara Brae, Childe (1931, 48) found traces of cetacean bone in an aperture, possibly a joist-hole, in the wall of a

passage and earlier excavations at the same site revealed the jaw-bones of a large whale lying across the hearth of a hut, as though fallen from above, suggesting that they had formed roof supports (*PSAS*, VII, 208 and 432).

Another use for the bones, particularly the small ones, if we again follow Olaus Magnus, was as fuel, a usage which likewise finds parallels among the mammoth hunters of Upper Palaeolithic times. Fresh cetacean bones were still used as an alternative to peat in the Faroes, certainly up till the beginning of the present century (Annandale, 1905, 38), which makes all the more significant Childe's observation (1931, 52) that an ash heap, overlying and in front of the fire-place of a Skara Brae hut, 'consisted principally of a mass of charred whale-bones mixed with burnt shells and bones'. Use of the large bones of whales for roofing and of small ones for fuel must be taken into account when estimating the relative importance of whales in the economy of a people from the contents of their middens. Even more important is it to remember that, except in areas where cetacean bone was used as a raw material for tools, stranded whales, a single one of which might enlarge the prospects of a primitive community for a whole season, would normally leave no trace at all in the rubbish heaps of an ancient dwelling-site.

ACKNOWLEDGMENTS

The author wishes to acknowledge guidance on the zoological side from Dr F. C. Fraser of the British Museum (Nat. Hist.). He has received invaluable help over the Scottish material from Mr R. B. K. Stevenson, Director of the National Museum of Antiquities, Edinburgh, and from Miss M. Platt of the Royal Scottish Museum.

APPENDIX I

LIST OF SITES YIELDING CETACEAN BONE IN PREHISTORIC EUROPE (FIG. 6)

Denmark.

- Borrebjerg, Sejrø. Iron Age. Killer Whale (2 teeth); Porpoise (vertebrae). Degerbøl, 1933, 396.
- Brabrand Sø, Jutland. Meso. III. White-beaked Dolphin (lower jaw-bone). *ibid.* 387.
- Bulbjerg, Thy. Late B.A. Greenland Whale (tail vertebra); Sperm Whale (tooth); Dolphin (vertebrae). *ibid.* 394.
- Dyrholm, Jutland. Meso. III. Porpoise (3 vertebrae); Common Dolphin (part of upper jaw, 5 vertebrae); Bottle-nosed Dolphin (5 vertebrae, haemaphysse). Mathiassen *et. al.*, 1942, 105.
- Ertebølle, Jutland. Meso. III. Killer Whale (piece of rib); Porpoise (single). Winge, 1904, 294.
- Fannerup, Jutland. Meso. III. Porpoise (vertebra). *ibid.*
- Frennemark, Bornholm. Neo. Porpoise (numerous individuals; vertebrae and other bones) Degerbøl, *op. cit.* 390.
- Gudsø Vig, Jutland. Meso. III. Cetacean bone made into barbed point. Mathiassen, 1935, 150 and fig. 21.
- Klintesø, Zealand. Neo. Porpoise (vertebrae, temporal bone). Winge, 1904, 294.
- Kolind, Jutland. Meso. III. Porpoise (?) (vertebra). Mathiassen *et. al.*, 1942, 123.
- Lindø, Langeland. Neo. Killer Whale (vertebra). Winther, 1928, 21.
- Meilgaard, Jutland. Meso. III. White Whale (vertebra). Degerbøl, 1933, 387.
- Nivaa, Zealand. Meso. III. Porpoise (tooth) *ibid.*
- Ordrup Naes, Zeal. Neo. Porpoise (single). *Aarbøger*, 1939, 224.
- Strandegaard, Zeal. Neo. Porpoise (single). *Aarbøger*, 1940, 23.

England.

- Kent's Cavern, Torquay. Neo./I.A. Porpoise (scapula). *Rep. Brit. Assoc.*, 1869, 208.
- Kingston Bucus, Sussex. L.B./E.I.A. Vessel (vertebra). *Sussex Arch. Coll.*, LXXII, 214-15, fig. 53. NOTE. Not shown on distribution map (fig. 6).

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

France.

Téviec. Meso. Large whale (bones); Small whale (teeth). Péquart, 1937, 100-1.

Holland.

Eenum, Lappersum. I.A. (terp). Sperm Whale (2 teeth). van Giffen, 1914, 102.

Schettens, Friesland. I.A. (terp). Killer Whale (3 bones). *ibid.* 103ff.

Ireland.

Curran Point, Larne. Meso. Whale bones. Movius, 1942, 132.

Tralee and Brandon Bays, Kerry. ND (midden). Two whale bones. *JRSAL*, 1914, 203.

Norway.

Bjørnerem, Mien. Stone/I.A. Porpoise. *KVSS*, 1912, nr. 12, 22.

Dalen, Skjörn Fd. Neo. Porpoise, White-sided Dolphin. *ibid.* 1911, nr. 5, 15.

Dolm, Hitteren. Stone/I.A. Killer Whale. *ibid.* 1910, nr. 2, 19.

Ruskeneset, Bergen. Neo. (Cist). Pilot Whale. Brinkmann and Shetelig, 1920.

Valderöia, Aalesund. I.A. Killer Whale. A. W. Brögger, 1926, 48-51.

Viste, Stavanger. Meso. III/Neo. Porpoise. A. W. Brögger, 1908.

Scotland (NOTE.—Pre-Viking Iron Age, unless specified).

Ayre, Orkney. Broch. Large bones, comb, vessel. *PSAS*, XLVIII, 49.

Bac Mhic Connain, N.Uist. Wheel-house. Combs, mallets, seats, knife handles, bodkins, dress-fastener. *PSAS*, LXVI, 50ff.

Berneray I. Midden. Oval plate perf. round edge; pointed implement. *PSAS*, XLIX, II.

Bowermadden. Broch. Hair-comb. *PSAS*, IX, 247.

Bragar, Lewis. Midden. Comb, whorl, perf. disc. *ibid.*

Bruthach a Tuath, Benbecula I. Earth-house. Vessel (broken). *PSAS*, LXIV, 14.

Burrian, N. Ronaldsay. Broch. Numerous objects, incl. combs, hammers, discs, mattock blades, etc. *PSAS*, LXV, 352-3.

Burray, Orkney. Broch. Vessel and wheel-like object cut from vertebra. *PSAS*, II, 157.

Cairston, Orkney. Broch. Mallet. *PSAS*, LXV, 353.

Caisteal-nan-Gilleann, Oronsay. Meso. midden. 3 bones, prob. Rorqual, one artificially pointed. S. Grieve, 1885, 55.

Clibberswick, Unst. Midden. Handled cup. *PSAS*, XLIII, 176-7.

Deerness, Orkney. Broch. Perf. whale bone. *Cat. Nat. Mus. Scot.*, 1892, 236.

Dun Troddan, Glenelg Broch. Curved piece with broad cut marks. *PSAS*, LV, 92.

Elsay, Caithness. Broch. Vessel, and rubbed slab. Childe, 1935, 245, n. 3.

Foshigarry, N.Uist. Wheel-house. Combs, mallet, vessels and some 30 mattock blades. *PSAS*, LXV, 328f, 351f.

Galson, Lewis. Earth-house. Var. bones; comb. *PSAS*, LVI, 260; LVIII, 201; LXXI, 358.

Garrylochdrach, N.Uist. Earth-house. Comb, etc. *PSAS*, LXVI, 41.

Geirisclett, N.Uist. House. Comb. Beveridge, 1911, 267.

Gullane, E. Lothian. Midden (date?). Frag., bones of 'very large whales'. *PSAS*, LXX, 332-41.

Harray, Orkney. Broch. Perf. bone and disc. *Cat. Nat. Mus. Scot.*, 1892, 236.

Hillswick, Shetland. Midden. 4 combs. *PSAS*, IX, 56f, 118.

Howe, Sanday. Broch. Key-like object. *PSAS*, LXXII, 9.

Hower (Knap of), Papa Westray. House. Mallet; many large, frag. bones. *PSAS*, LXXI, 315, 320.

Howmae, N. Ronaldsay. Wheel-house. Combs, vessel, mattock blade, etc. *PSAS*, XIX, 27f; XXIV, 458f.

Hoxay (How of), S. Ronaldsay. Broch. Sperm Whale tooth; vertebra (sp.?). *PSAS*, IX, 360f.

Jarlshof, Shetland. (a) Late Bronze Age village. Fragment. *PSAS*, LXVIII, 318.

(b) Broch. Vessels. *PSAS*, XLI, 28; LXV, 353.

Keiss, Caithness. Harbour, Road and Wester brochs. Comb-shaped rubber, perf. objects, comb. *PSAS*, VII, 83; XXXV, 142, 121.

ANTIQUITY

- Kettleburn, Caithness. Broch. Var. bones ; 2 combs. Anderson, 1883, 215 ; *Arch. J.*, x, 212f.
- Kintradwell, Caithness. Broch. Bones of Killer Whale and Porpoise. Anderson, 1883, 221.
- Lingrow, Orkney. Broch. Comb. *PSAS*, ix, 360.
- Machair Leathann, N. Uist. Wheel-house. Vessel ; frags. of bone. Beveridge, 1911, 119-20.
- Nybster, Caithness. Broch. Comb ; perf. object. *PSAS*, xxxv, 142.
- Okstrow, Orkney. Broch. Rectangular plate. *PSAS*, xi, 84.
- Papa Westray, Orkney. Midden nr. St. Nicholas' church. Perf. slab. Nat. Mus. Cat. GA.
- Sanday. 'Picts house'. Comb. *PSAS*, v, 15.
- Saverock, Orkney. Earth-house. Mattock blades. *PSAS*, lxv, 352.
- Shapinsay, Orkney. 'Picts house'. Vessel. *PSAS*, iv, 380.
- Sithean an Altair, Vallay, N. Uist. Earth-house. Numerous bones. Beveridge, 1911, 119f.
- Skaill, Sanday. Broch (?). 2 combs, 2 vessels. *PSAS*, xlvii, 9 ; LI, 129.
- Skara Brae, Orkney. Neo. village. Numerous bones, incl. roofing material, vessels, mallet, etc. Childe, 1931, *passim*.
- Skirza Head, Caithness. Broch. Perf. disc. *PSAS*, xxxv, 145 ; lxv, 353.
- Stenabreck, N. Ronaldsay. Wheel-house. Key, disc., etc. *PSAS*, xix, 20.
- Tain, Ross. Midden. Perf. square plate. *PSAS*, lxv, 353.
- Tota Dunaig, Vallay, N. Uist. Houses. 2 semi-circular pieces with toothed edge ; perf. disc. Beveridge, 1911, 232-3.
- Yarhouse, Caithness. Broch. Smoothed slab (frag.). Nat. Mus. Cat. GK, 43.

Sweden.

- Anneröd, Bohuslän. Neo. White-beaked Dolphin ; Sowerby's Whale. *Ymer*, 1906, 20.
- Gullrum, Gotland. Neo. Porpoise (common). Nihlén, 1927, 192.
- Hemmor, Gotland. Neo. Porpoise (7 bones) ; Killer Whale (5 teeth). *ibid*.
- Rörvik, Bohuslän. Neo. White-beaked Dolphin (4 bones) ; Porpoise (1 bone). Henrici, 1936, 36.
- Visby, Gotland. Neo. Common Dolphin (1 bone). Nihlén, 1927, 192.

APPENDIX II

LIST OF REPRESENTATIONS OF WHALES IN THE STONE AGE ROCK-ENGRAVINGS OF NORWAY.

(See map, FIG. 6).

- A. Leiknes. Small Toothed Whale. Gjessing, 1932, 24 and pl. ix.
- B. Valle. Common Porpoise. *ibid*. 61 and pl. xxviii.
- C. Forselv. Small Toothed Whale. *ibid*. 26 and pl. xii.
- D. Klubba. 2 Killer Whales (prob.). *ibid*. 10-11 and pl. i, 4 ; pl. ii, 10.
- E. Rödöy. 2 Common Porpoises. Gjessing, 1936, 128 and pl. vii ; pl. xlix.
- F. Strand. Pilot Whale. *ibid*. 128 and pl. lii.
- G. Bardal. Bottlenose Whale (prob.). *ibid*. 128 and pl. lxiv.
- H. Evenhus. Eleven Common Porpoises ; One Killer Whale. Gjessing, 1936, 83ff and pl. lxxvii.
- I. Bogge II. Six Common Porpoises. *ibid*. 125-6 and pl. lxxxiii.
- J. Skogervejen. Two Dolphins. Engelstad, 1934, pl. xiv and xx.

ABBREVIATIONS :

- JRSAL*. *Journal of the Royal Society of Antiquaries of Ireland, Dublin.*
- KVSS*. *Det Kgl. Norske Videnskabers Selskab Skrifter, Trondhjem.*
- PSAS*. *Proceedings of the Society of Antiquaries of Scotland, Edinburgh.*

WHALES AS AN ECONOMIC FACTOR IN PREHISTORIC EUROPE

REFERENCES

- Anderson, J. *Scotland in Pagan Times: The Iron Age*. Edinburgh, 1883.
- Annandale, N. *The Faroes and Iceland*. Oxford, 1905.
- Bannatyne Club, The. *Excerpta e libris domicilii domini Jacobi Quinti regis Scotorum*. MDXXV-MDXXXIII. Edinburgh, 1836.
- Beveridge, E. *North Uist: Its Archaeology and Topography*. Edinburgh, 1911.
- Beveridge, E. and Callander, J. G. 'Excavation of an Earth-house at Foshigarry, and a Fort, Dun Thomaidh, in North Uist'. *PSAS*, LXV (1931), 299-357.
- Boas, F. 'Second Report on the Eskimo of Baffin Land and Hudson Bay'. *Bull. Am. Mus. Nat. Hist.*, xv (1907), 371-570.
- Bosworth, Rev. J. *A literal translation of King Alfred's Anglo-Saxon version of the Compendious History of the World by Orosius*. London, 1855.
- Brinkmann, A. and Shetelig, H. *Ruskeneset. En stenålders jagtplass*. Norske Oldfund, III. Christiania, 1920.
- Brøgger, A. W. *Vistefundet. En ældre stenålders kjøkkenmødding fra Jaederen*. Stavanger, 1908.
- . *Kulturgegeschichte des Norwegischen Altertums*. Oslo, 1926.
- Callander, J. G. (See Beveridge, E.).
- Catalogue of the National Museum of Antiquities of Scotland*. New Edition. Edinburgh, 1892.
- Childe, V. G. *Skara Brae, a Pictish Village in Orkney*. London, 1931.
- . *The Prehistory of Scotland*. Edinburgh, 1935.
- Clark, J. G. D. 'Seal-hunting in the Stone Age of North-western Europe: A Study in Economic Prehistory'. *Proc. Prehist. Soc.*, XII (1946), 12-48.
- Curle, A. O., 'Account of further excavation in 1932 of the prehistoric township of Jarlshof, Shetland'. *PSAS*, LXVII, 82-136.
- Debes, J. *Faerøe et Faeroa reserata: That is a Description of the Islands and Inhabitants of Faeroe*. (Transl.) London, 1676.
- Degerbøl, M. 'Danmarks Pattedyr i Fortiden i sammenligning med recente Former'. *Vidensk. Medd. Nat. For.*, bd. 95, 357-641. Copenhagen, 1933.
- Deinse, A. B. van. 'Over de Vinvischen in de Landen om de Noordzee gestrand tusschen de Jaren, 1306-1918'. *Zool. Meded. Mus. Nat. Hist. Leiden*, Deel IV, Afl. I, 179-245.
- Engelstad, E. S. *Ostnorske Ristninger og Malinger av den Arktiske Gruppe*. Oslo, 1934.
- Eschricht, D. F. *Untersuchungen über die nordischen Wallthiere*. Leipzig, 1849.
- Fischer, P. 'Cétacés du Sud-Ouest de la France'. *Actes Soc. Linn. Bordeaux*, xxxv (4th ser., v), pp. 5-219. 1881.
- Giffen, A. E. van. 'Die Fauna der Wurten'. *Tijdschrift der Nederlandsche Dierkundige Vereeniging*, 2e. ser. d. 13, 1914, 1-166. Leiden.
- Gjessing, G. *Arktiske Helleristninger i Nord-Norge*. Oslo, 1932.
- . *Nordenfjelske Ristninger og Malinger av den arktiske gruppe*. Oslo, 1936.
- Grettir the Strong, Saga of*. Transl. from the Icelandic by G. A. Hight. Everyman Edition.
- Grieve, S. *The Great Auk, or Garefowl*. London, 1885.
- Harmer, Sir S. F. *Report on Cetacea stranded on the British Coasts from 1913 to 1926*. British Museum (Nat. Hist.). London, 1927.
- Henrici, P. 'Benfynd från boplatsen vid Rörvik'. *Göteborgs och Bohusläns fornminnesförenings Tidskr.*, 1936, 82-91.
- Hentschel, E. *Naturgeschichte der nordatlantischen Wale und Robben*. Handbuch der Seefischerei Nordeuropas, bd. III, hft. I. Stuttgart, 1937.
- Japha, A. 'Zusammenstellung der in der Ostsee bisher beobachteten Wale'. *Schr. Phys.-ökonom. Ges. Königsberg*, XLIX Jhg. (1909), 119-189.
- Joyce, P. W. *A Social History of Ancient Ireland*. London, 1903.
- Keller, O. *Die antike Tierwelt*, 2 bd. Leipzig, 1909 and 1913.
- Le Strange, H. *Le Strange Records*. London, 1916.
- Martin, M. *A Description of the Western Isles of Scotland*. (Orig. publ., London, 1703). Stirling, 1934.

ANTIQUITY

- Mathiassen, T. *Archaeology of the Central Eskimos*, II. *The Thule Culture and its position within the Eskimo Culture*. Copenhagen, 1927.
- . 'Blubber lamps in the Ertebølle culture'? *Acta Archaeologica*, VI, 1935, 139-152.
- Mathiassen, T., Degerbøl, M. and Troels-Smith, J. *Dyrholmen. En Stenålderboplads paa Djursland*. Kgl. Danske Vid. Selsk. Ark.-Kunsthist. Skr., bd. I, nr. I. Copenhagen, 1942.
- Miller, S. H. and Skertchly, S. B. J. *The Fenland Past and Present*. Wisbech, 1878.
- Morris, D. B. 'The Whale remains of the Carse of Stirling'. *The Scottish Naturalist*, 1924, 137-140; also, *Stirling Nat. Hist. and Arch. Soc. Trans.*, 1923-4, 142-6.
- Movius, H. J. *The Irish Stone Age*. Cambridge, 1942.
- Munro, R. 'The Relation between Archaeology, Chronology and Land Oscillations in post-glacial times'. *Arch. J.*, LV (1898), 59-85.
- Murdoch, J. *Ethnological results of the Point Barrow Expedition, 1881-3*. 19th Ann. Rep. Smithsonian Inst., Washington, 1892.
- Nihlén, J. *Gotlands Stenåldersboplatser*. Stockholm, 1927.
- Nordmann, V. *Menneskets Indvandring til Norden*. Dan. Geol. Unders. III R. Nr. 27. Copenhagen, 1936.
- Norman, J. R. and Fraser, F. C. *Giant Fishes, Whales and Dolphins*. London, 1937.
- Olaus Magnus. *Historia de gentibus septentrionalibus*. Rome, 1555.
- Peckham, W. D. *The Chantry of the High Church of Chichester*. Lewes, 1946.
- Péquart, M. and S.-J. *Téviec. Station-nécropole mésolithique du Morbihan*. Arch. Inst. Pal. Hum. Mem. 18. Paris, 1937.
- Robertson, A. J. *Anglo-Saxon Charters*. Cambridge, 1939.
- Ross, Alan, S. C. *The Terfinnas and Beornas of Ohihere*. Leeds, 1940.
- Schreiner, K. E., in *Osebergfundet*, bd. V, 301-4. Oslo, 1927.
- Skertchly, S. B. J. *The Geology of the Fenland*. London, 1877.
- Southwell, T. *The Seals and Whales of the British Seas*. London, 1881.
- Turner, Sir W. 'On some implements of Stag's Horn associated with whales' skeletons found in the Carse of Stirling'. *Rep. of the 59th Meeting Brit. Assoc.*, 1889, 789-791.
- . *The Marine Mammals in the Anatomical Museum of the University of Edinburgh*. London, 1912.
- Venner, T. *Via recta ad vitam longam*. London, 1650.
- Winge, H. 'Om jordfundne Pattedyr fra Danmark'. *Vidensk. Medd. Nat. For.*, 1904, 193-304. Copenhagen.
- Winther, J. *Lindö: en boplads fra Danmarks yngre Stenålder*, vol. 2. Rudkjøbing, 1928.

Notes and News

BOTTLE IMPS

Many readers, in their childhood's days, may have possessed a toy known sometimes as a Bottle Imp, sometimes more grandly as a Cartesian Devil or Diver. A clear glass bottle nearly full of water was sealed at the top by a rubber cap; in the water floated a little figure of an imp or diver made of coloured glass; by varying the pressure on the rubber cap with one's thumb the imp could be made to move up and down in the water.

The principle involved is approximately that known as Boyle's law. The figure is hollow and the legs or tail form an open tube; the head contains a bubble of air. When the pressure on the surface of the water is increased the air in the head is compressed, more water enters the figure, and consequently its weight increases and it sinks.

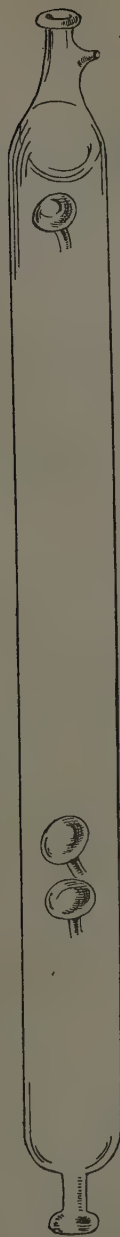
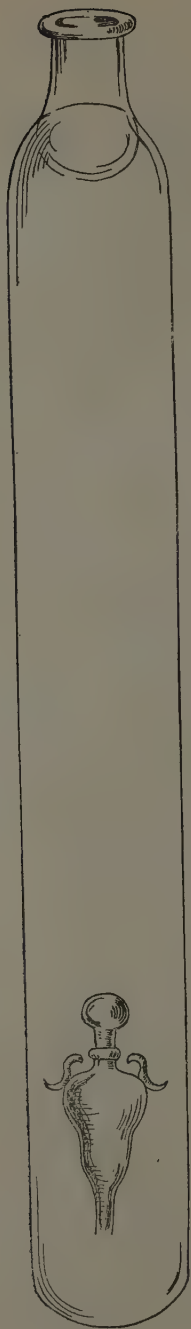
It is not, as far as I am aware, generally known that these scientific toys go back to at least the first quarter of the seventeenth century. In the Royal Library at Windsor Castle there are five large albums of drawings and paintings representing part of the contents of the Museum of the Accademia dei Lincei at Rome about the year 1625. These albums are labelled 'Fossils', and it is as a geologist that I have had the privilege of examining them. Some objects of antiquarian as well as geological interest I have already described and figured in this journal (1). At the end of the album of water-colour paintings there are included two plates each showing two bottle imps, the place of the imps being taken by sundry objects which we may call 'bubbles'.

All four containers are of clear glass, about eight inches long, the width varying from three-quarters to one-and-a-quarter inches. Three are sealed at the top except for a small perforated projection through which pressure could be varied by the mouth; the fourth (on the left in the figure) has an open top. In this the only 'bubble' is an elaborate ornament of Venetian (Murano) glass, the body clear, the top green, stem yellow and the two little scrolls on the shoulder blue. In another (not shown here) the bubbles are variously coloured to resemble small fruits, each with a green stalk. That shown here on the right has three bubbles, one at the top and two submerged; the globes are of blue glass and, in the original painting, the contained air-bubbles are clearly shown.

The Academy of the Lynxes regarded these bottles as worthy of preservation and illustration in colour in the catalogue, just as, some fifty years later, the Royal Society's collections included scientific apparatus which was duly catalogued by Nehemiah Grew. We cannot say for certain who invented them, but the actual manufacture was obviously at Venice, and the name of Fra Paolo Sarpi immediately suggests itself; he died at Venice in 1623. Most of his manuscripts were destroyed, but a notebook called *Pensieri* is in St. Mark's Library and shows clearly his interest in the subjects involved. Alexander Robertson, in his book *Fra Paolo Sarpi, the Greatest of the Venetians* (2nd Ed. London, 1894, p. 51) writes as follows:—'In *Pneumatics* he made many interesting experiments, and it was to him Galileo turned when studying the condensation and rarefaction of the atmosphere; and he it was who gave to Torricelli the thoughts he develops in his book on *Atmospheric Pressure*.

A further interest in these early scientific toys is the light they throw on a famous Englishman of science. In the year 1671 'the Noble Robert Boyle' laid before the Royal Society an account of a 'New Experiment concerning an Effect of the Varying

¹ 'Aetites or the Eagle-stone,' *Märch* 1947, pp. 16-22.



Weight of the Atmosphere upon some bodies in the Water'. The paper is printed in *Phil. Trans. R. Soc.*, vol. VII, no. 91 for 24 February, 1672-3. 'I caused to be blown at the flame of a Lamp three small round Glass-bubbles about the bigness of Hazel-nuts, and furnish'd each of them with a short and slender stem, by whose means they were so nicely poised in water, that a very small change of Weight would make them either emerge, if they but lightly leaned on the bottom of the Vessel, or sink, if they floated on the top of the Water'. He describes how, in an open vessel, the bubbles would serve as a barometer and would also change position with a change of temperature; 'yet 'twas not difficult to distinguish those motions from those produced by the varying Gravity of the Atmosphere'. Boyle's account does not mention the use of coloured glass, which obviously makes the position of the bubbles at any time more easily observable; but glass-making in England at the time was far behind that of Murano.

These vessels had already been painted as scientific curios some 50 years before Boyle described his 'new' experiment. It is, of course, possible that we have here a case of the same invention being made independently in different countries at different times. But Boyle was in Rome in the spring of 1641-2, when, in his own words, he 'surveyed the principal rarities of this proud mistress of the world'. (2). Is it possible to doubt that he visited Cassiano dal Pozzo, who was then President of the Academy in whose museum the earlier bottle imps were preserved?

In a well-known history of science it is claimed that Boyle proved that air is a material substance having weight. That no doubt is true, as it is of every schoolboy who enters a physics laboratory; but Empedocles did the same about the year 450 B.C. (3).

The claim on his memorial in Ireland that Boyle was 'the Father of Chemistry and Uncle of the Earl of Cork' is familiar; his avuncular title to fame will always be indisputable, but the paternal appears to have been based to some extent on adoptive rather than creative activity.

C. N. BROMEHEAD.

SOME FEATURES OF TYROLESE ARCHAEOLOGY

As the Editors and its contributors have for so long directed attention to all problems connected with ancient agriculture, *ANTIQUITY* may seem the right place to point out the existence of field-terraces even in Tyrol.

They occur there at various places on sloping ground, and can be traced up to the height of 1500 metres above sea-level. Often they are 100 metres long and 3 metres broad. They do not lie on abandoned soil, but are still used today, partly as fields, partly as meadows. When questioning the inhabitants of near-by villages about the age of the terraces one learns that no farmer of today lays out such ones, and that the terraces must date from time immemorial. Not content with this rustic opinion, the archaeologist searches for reliable evidence; but hitherto, unfortunately, in vain. Perhaps it is of some chronological value that the terraces seem to be wanting in countries with medieval colonization. Terraces are not found in the lower Inn Valley, while they are abundant in western Tyrol and in the Engadin (Switzerland), where pre-German settlers long dwelt by the side of German ones.

It would be very useful to get all the terraces mapped; then one would have a clear view of their distribution both horizontally and vertically. Moreover, one must distinguish between lower terraces with steep earth-slopes and higher ones with vertical (or

² T. Birch, *Life of The Honourable Robert Boyle*, 1744, p. 47.

³ See Aristotle, *De Resp.*, Cap. VII, 473 b; or Professor B. Farrington's *Pelican Book on Greek Science*, pp. 51, 52.

nearly vertical) dry stone walls. The latter type, which today in Southern Tyrol is still used for vineyards, seems to be of younger origin.

Many Tyrolese villages had their rise in medieval times and even in the Dark Ages, but others of them have prehistoric predecessors. The village of Natters in the vicinity of Innsbruck probably has a Roman and Late Iron Age ancestor, as is shown by respective finds. Therefore the terraces of Natters might be from before the Dark Ages. The terrace of Birgitz near Innsbruck lies opposite a hilltop site of the 1st century B.C. (1). It is not absurd to think that the inhabitants of this Iron Age place had their fields in this slope, that they made cultivable by terraces.

One is disposed towards the assumption that the terraces are plough-made, not formed by digging. This means, naturally, that they can not be older than the use of the plough. In Tyrol we have no trace of a plough from any prehistoric period, not even in Southern Tyrol; we know only iron hoes. But that says nothing against the prehistoric plough; to draw conclusions *ex silentio* would be fallacious. At all events it is probable that the terraces are made by a primitive plough. Today the farmers in the Tyrolese mountains plough even steep acres, but they do it not by making terraces, because their oxen-drawn iron plough is able to go up and down. The medieval and prehistoric ploughmen were forced to traverse the slope, and they facilitated the labour, even on slight slopes, by producing terraces. The Tyrolese farmers of today sometimes work on very steep slopes without a plough, but with a special hoe; but they do not make terraces.

Old field-terraces can be seen in other parts of Austria, too, e.g. in Salzburg. In Southern Bohemia I know an example of field-terracing (of late aspect) that overlies the remains of a Late Celtic oppidum, thus giving a terminus post quem (2).

The terraces on the Continent and in Great Britain are not due to an ethnic community, but to a similarity of conditions. A different case may be the custom of building dwellings partly in the soil. Such were the houses of the site of Birgitz, quoted above and of the contemporary site of Vill near Innsbruck (3). A hill was dug into off and on the platform, which arose in this way, the stone walls of the buildings were erected; two, three or four walls, according to the local conditions, directly leant against the hill. At Vill are to be seen remains of buildings in two levels. The floor of the rooms lay, so to speak, below ground; the roof must have risen above the hill-surface. Such buildings have been excavated in France, e.g. in the Celtic oppidum of Mont Beuvray. The inhabitants of the above-quoted Celtic site in Bohemia may also have dwelt in half underground buildings; one can conclude that from the considerable depth of the culture-stratum. In Northern Italy Late Iron Age buildings, partly dug in the soil, have been excavated at San Zeno (province of Trento).

Underground dwellings originated from certain neolithic cultures; they are an invention made by an agricultural, not by a cattle-breeding people, as a convenient remedy against the cold. But there exist also other means for the same purpose, e.g. double stone walls with interval filled with earth, as on the Hebrides (4). Therefore one can suppose that the distribution of prehistoric subterranean dwellings in Western and Middle Europe is originally due to an ethnic community or, at least, to cultural intercourse.

LEONHARD FRANZ.

¹ See ANTIQUITY, 1939, p. 101. A fuller account of the excavation there by O. Menghin is printed in *Wiener Prähistorische Zeitschrift* 26 (1939) p. 37.

² L. Franz, *Eine keltische Niederlassung in Südböhmen* (Prague 1942), p. 20.

³ H. Miltner, *Die Illyer-Siedlung in Vill* (Innsbruck, 1944).

⁴ See C. Curwen in ANTIQUITY 1938, p. 261.

Reviews

EXCAVATIONS AT DURA-EUROPOS. Report IV, part II: the Textiles. By R. PFISTER and LOUISA BELLINGER. Yale University Press, 1945. pp. 64. *Frontispiece in colour, 33 plates, 4 being in colour.*

This book marks an epoch in the history of the ancient textiles of the Near East because the fragments described are unusually well dated and have been treated and studied with a complete acceptance of modern archaeological ideals.

Dura fell about A.D. 256 and it is assumed that the great majority of the textiles found there were made not many years before the middle of the century. All were incomplete, some old and patched, yet from these rags and tatters, studied with care, much has been learnt of the garments worn by the citizens, of the rugs and hangings which adorned their houses, and the technique of the fabrics used for these purposes. The knowledge thus acquired is linked in one section of the book with evidence from the paintings of Dura, particularly those of the Synagogue, with their wealth of people dressed in different ways, and also with evidence from inscriptions including an amusing list of articles, with their prices, compiled by Welles. From the latter one learns, for example, that a simple tunic, such probably as that figured on plate VI, could be bought for 32 denarii in Dura, while the more ample dalmatic varied between 30 and 60 denarii.

The catalogue of 328 textiles from Dura in its final form is the work of Miss L. Bellinger, based on a catalogue made by R. Pfister of the finds of 1932-33 and the description of those of 1928-29 by Miss L. Wilson in the second report. It gives all the essential information such as size, material, direction of spinning, technique and colour, and, in many cases, the dyestuffs used.

The textiles of Dura, mostly made of wool, are not lacking in colour. There are purple fragments from bands and ornaments on white Hellenistic tunics and mantles, and fragments in many colours which may have come either from the highly ornamented Iranian costumes also in vogue, or from decorated cushions and curtains. Examples of these pieces are shown in colour on the frontispiece and four other plates accompanied by a colour series from photographs of selected fragments.

The attention paid to colour is one of the remarkable features of this book, and is due to the pioneer work of Pfister. He made the first tests himself and the later ones were made at Yale by Toll working on the lines he laid down. The blues were found to come from indigo, as also the greens with the addition of a yellow dye; reds and pinks were mostly from madder, with a few examples of a red violet 'the colour of military chiefs' from kermes. All the first purples examined were from madder and indigo, but later Toll diagnosed true murex purple in three cases, nos. 57, 58 and 61. This discovery confirms hopes raised by references to purple in the inscriptions at Dura as well as mentions in list of a 'purple dalmatic' and a 'purple rug', in all of which the word *πορφύρα* may now be interpreted as true purple, not the imitation in madder and indigo, though the costly murex purple was no doubt less plentiful at Dura than at Palmyra.

The work in determining these dyestuffs on ancient textiles has been exceedingly laborious, involving hundreds of experiments before suitable tests could be devised and it is still difficult. All the more credit is due to the pioneers in this field, but we may hope that in the future perhaps new methods in the use of the spectroscope may do away with much of the labour.

On the technical side another excellent bit of work has been done in the elucidation of the woollen pile fabrics; both the Ghiordes and Sehna knots occur, as well as curious

ANTIQUITY

varieties of looped pile, one of which has been named by Miss Bellinger 'Sehna Loops'. Some of these fabrics must have been rugs and one has a geometric pattern in the knots; there is also a pile cap with a point like the caps on Parthian coins. Of the patterned pieces, in tapestry weave, the most interesting are those with shaded and decorated bands like that shown in colour on plate III; this resembles a piece at Palmyra (*Textiles de Palmyre III*, L126 on pl. B b.) both in technique and in the Hellenistic floral design. Shading must have pleased the popular fancy as the attractive roses on the frontispiece also pass from dark red through shades of pink to white, but differently, the shades instead of being gradual are in definite bands.

As at Palmyra some woollen twills were found, all of a simple character. There are general resemblances also with Palmyra in the fragments of white garments with their purple designs, which include arrow-heads, stepped pyramids, H, L and Z shaped bands, a floral pendant and a good vine and leaf ornament, but there is one striking difference. At Palmyra, as in Egypt in this as in earlier periods, white clothing was of linen, while at Dura it was mostly of wool. Wool indeed was the chief material found, with some goat's hair, though linen also figures in the lists; silk occurred in two cases, cotton in one case only.

This short account is enough to show how valuable this book is for the study of the material, technique and ornament of the period. It is difficult to make a criticism of it without feeling captious and ungrateful. But there are one or two weak places, probably because the war prevented a final collaboration between the authors. For example, on page 3 there is an out of date quotation implying that no polychrome silks of the Han period have been found in Palmyra whereas fragments of such silks are published in *Textiles de Palmyre III*, 1940 (see pl. XVI, s 44). Also the interesting silk fragment, with pattern in reverse, no. 263, on which the authors are not in complete agreement, might have been more fully discussed. The piece was published as a warp pattern by Pfister (T.P. II, 1937, p. 38 and pl. IX e) while Miss Bellinger considers it as a weft pattern. The question is not purely academic, for if Pfister is right it is in all probability Chinese, on Miss Bellinger's theory it may be a local Syrian imitation. The fragment measures about 6 in. by 3 in., has no selvedge, and the pattern presents an attractive weaving conundrum. The decision is of some importance with regard to other textiles with pattern in reverse, so it looks as if the stage was set for a very pretty discussion between students of early silks.

To conclude I should like to draw the attention of knitters to the fact that a charming knitting pattern (Crossed Eastern) is worked out in full on page 54.

GRACE M. CROWFOOT.

BAALBEK AND PALMYRA. Photographs by HOYNINGEN-HUENE with Text by DAVID M. ROBINSON. *J. J. Augustin, New York*, 1946. pp. 136 including 66 photographs and 2 maps. 7 dollars and 50 cents.

Baalbek and Palmyra, both of them sublime cities, are associated in my mind with a ridiculous incident. Some years ago I engaged a Metawileh Arab from Baalbek to drive a lorry across the desert to Palmyra. This man, Abdullah by name, who looked surprisingly like an emaciated horse, attempted to drive the car, read a newspaper and light a cigarette simultaneously. As the day was exceedingly hot the newspaper soon went up in flames which, by the grace of God and our joint efforts, ignited Abdullah's tarbush but not the load of petrol behind us. From then onwards our journey was uneventful till we reached what Gertrude Bell has so aptly described as 'the white skeleton of a town standing knee-deep in the blown sand'.

REVIEWS

Such memories, and a pleasant nostalgia for Syria and the Lebanon are evoked by the sight of Hoyningen-Huene's beautiful photographs. Once again we can see the white columns of Palmyra bleached by the desert sun, and the gold and grey temples of Baalbek wreathed in cherry blossom, with snow-capped Lebanon in the distance. It is curious to discover that Baalbek is more photogenic than Palmyra, perhaps on account of its background. I would have preferred the pictures without their narrow white margins, but they are the work of an acknowledged master of photography with a fine feeling for composition and an eye for attractive detail.

This is a luxurious book, beautifully printed, an expensive but suitable present for travel-starved persons, and a necessary addition to architectural libraries. The text, written by David M. Robinson of the Johns Hopkins University is, as we should expect, clearly written and authoritative. It is of course exceedingly difficult, if not impossible, in a work of this kind to satisfy both the specialist and the amateur. Many of the measurements and some of the detailed architectural descriptions might perhaps have been better assigned to the back of the book, which contains an adequate bibliography. The description of Baalbek is much less interesting than that of Palmyra, which has yielded far more historical information on the organization of the city in ancient times. But Baalbek can hardly fail to rouse our imagination, more especially in these days of jerry-building, for its masons could with equanimity contemplate the quarrying of a single stone weighing roughly a thousand tons, and for them obviously the moving of enormous blocks presented little difficulty. These things are easy to do if you know how to do them, even with the simplest form of tackle; but there are certain requisites for the performance. You must have adequate labour working in conditions where 'go slow' means go sure; you must be prepared to take infinite pains; and you must not be restricted by a five-day week. It is interesting to learn that Nero, whom we may credit with an artistic temperament, may have had a hand in the foundation of the Sun Temple of Jupiter. The guide books formerly associated that building with the name of Antoninus Pius, though one authority at least assigns it to the Emperor Augustus.

Baalbek like Palmyra was a caravan city: it lay on a caravan route mid-way between Damascus and Beirut and was easily accessible from Tyre; but unlike Palmyra it lay in the midst of a very fertile plain, the Beká', and it did not have to operate solely as a caravan city in order to earn its daily bread. The prosperity of Palmyra no doubt owed much to the efficiency of the Companies responsible for the organization of its caravans, and it is interesting to note that a number of powerful Jewish families participated in these activities. That prosperity was also due to the political astuteness of the Palmyrene rulers who successfully played off the Parthians on their right against the Romans on their left, and achieved an increasing measure of independence which culminated in the decisive victory of Odaenathus, husband of Zenobia, over the Sassanian king Shapur in A.D. 261. It may seem surprising that either Parthia or Rome allowed Palmyra to achieve such independence, but the fact is that so long as those two powers were matched against one another, neither could afford to dispense with the services of the Palmyrene trade organization, for it was impossible to hold that oasis in permanent subjection without controlling both the eastern and the western end of the desert trade route. What the author does not explain is why it was ever necessary to use this difficult desert route instead of the well-watered line of the Euphrates. An answer to this question has been given by Professor M. Rostovtzeff in his *Social and Economic History of the Hellenistic World*. Rostovtzeff connects the increase of Palmyrene traffic with the disappearance of the Attalid control of Asia Minor after 150 B.C., when the Anatolian roads apparently became unsafe, and he interprets the disappearance of coins struck in

ANTIQUITY

Asia Minor from the Syrian coin hoards after that date as a further indication of the changed trade route. Coincident with this evidence is Strabo's record of the increase of banditry on the middle Euphrates at about the same period. If these deductions are correct they may account for the steady growth of Palmyrene traffic between the 1st and the 3rd centuries A.D.; and in fact until Queen Zenobia courted disaster through her overweening ambition, the Palmyrene route, well organized and well policed, became the main channel for trans-Mesopotamian traffic to the Phoenician coast. The Indian and South Arabian trade were catered for by Petra, but far Eastern goods were also finding their way to Palmyra as is proved by the discovery in that city of Chinese silks manufactured under the Han dynasty. That of course does not mean that there was any abandonment of the Chinese silk route which ran north of the Caspian to its terminal at Panticapaeum on the Black Sea. Perhaps the most important receiving end for Oriental traffic was the island of Delos where large numbers of Semitic merchants held fonduks for Syrian trading houses. Delos was the entrepot for the redistribution of Eastern goods to the Italian and Anatolian markets.

The story of Palmyra raises many fascinating questions which no doubt will be discussed in the light of fresh evidence when the definitive French publication of their pre-War excavations appears. Apparently however there is still no archaeological evidence for the Aramaean settlement which is known to have existed in Tadmor in the second millennium B.C. The tale of the two cities discussed in this book, still but half told, has stirred the poet no less than the historian. And of the poets, who has spoken better than Robert Bridges in the *Testament of Beauty*?

With their bright broken beauty they pervade the abyss,
Peopling the Solitude with gorgeous presences :
As those bare lofty columns, time-whiten'd relics
Of Atlantean adoration, upstanding lone
In Baalbec or Palmyra, proudly affront the waste
And with rich thought atone the melancholy of doom.

M. E. L. MALLOWAN.

[N.B. in the quotation from Robert Bridges, Baalbec (*sic*) and Atlantean (*sic*).]

FARUK ZEKI PEREK. Lâtinçe-Türkçe Sözlük. Fasikül 1. *Istanbul (Universite Matbaası)*, 1946. 112 pp. 60 Kuruş.

This is the first instalment of an elementary Latin-Turkish dictionary (A to Cella) designed to include all the words which students are likely to meet with in their reading. References and quotations are excluded, and no attempt is made to distinguish between the different periods of the language, or to differentiate between rare and common words.

The dictionary appears under the auspices of the Institute of Classical Studies at the University of Istanbul, and is a welcome sign of the interest which modern Turkey takes in Greek and Roman antiquity. The Ministry of Education is actively sponsoring the translation of Greek and Latin classics, and the list of authors available in Turkish is constantly growing. The author of the dictionary, who is lecturer in Classics at the University, expresses his conviction that the study of the Graeco-Roman world, which is the foundation of Western culture and of Western educational systems, will in due course play an important part in Turkish education. It is to be hoped that the work of archaeologists on the Classical sites in Turkish territory will benefit from this enlightened attitude of the government and people of Turkey.

S. HILLELSON.